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ABSTRACT

The Iowa Clean SWEEP program is designed to provide educators, K-12, with a series of activities focusing upon critical concepts related to Iowa's solid waste problem. This activity packet contains 19 activities for grades K-6, and 25 activities for grades 7-12. Key concepts addressed throughout the activity packet include: (1) an overview, the finiteness of natural resources, and waste generation; (2) current waste disposal practices and volume reduction; (3) landfill problems and recycling; (4) methods of reusing, reducing, and recycling for waste management; and (5) waste costs and personal commitments. Each activity includes a "My Little Bit" and a "We Can Make a Difference" section designed to initiate personal commitment. Additional activity sections are objectives, activity in brief, materials, grade level, subjects, time, group size, skills, vocabulary, concepts, procedure, discussion questions, extension, evaluation, and background. An appendix provides a conceptual framework, additional activity suggestions, background information on common packaging materials and solid wastes, general information on landfills, recycling resources, a poem, and a glossary. (LZ)

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Iowa's CLEAN

Solid
Waste
Environmental
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Project

ED 405 181

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Introduction

CONGRATULATIONS! You have joined the many educators who are concerned about the environment and the resources of this planet.

Iowa Clean SWEEP is a compilation of hands-on activities which will invite young people to THINK!.....about finite resources.....about the pressure upon these resources by escalating populations.....about our everyday choices which can make a difference in our planet's well-being. RECYCLING is but one aspect in the over-all picture. REDUCING our dependency upon THINGS, RETHINKING what we buy, and REFUSING to buy unnecessary resource-exhaustive packaging are other aspects to consider in the waste reduction picture.

Each activity will incorporate MY LITTLE BIT, challenging each learner to make individual choices and take individual action that WILL make a difference in the quality of the environment. Learners will also see that when we combine our efforts and work together WE CAN MAKE A DIFFERENCE!

The word LEARNER is used to describe the young person for whom the activity is written. It is our hope that the term EDUCATOR will encompass any adult leader working with young people, be it teacher, 4-H, church or Scout leader.

ELEMENTARY SECTION:
The activities in the elementary section are arranged according to concepts which build upon each other. The educator could start at the beginning and go to the end and thus build a complete waste reduction/recycling unit. Or the educator could pick and choose activities to incorporate into the existing curriculum.

These activities can be modified and scaled up or down to meet the abilities of all the K-6 grades. We encourage the primary teacher to simplify and the intermediate teacher to build upon the activity framework.

The elementary section is preceded by a section entitled: Designing A RETHINK Classroom. The teacher is challenged to have an environment conducive to thinking each and every day about the choices we make regarding our resources.....our earth.

SECONDARY SECTION:
The secondary section attempts to include activities suitable for all subject areas, 7-12. With instructor adaptations the activities could be used with school classes and youth group organizations. The degree of difficulty and student comprehension level may be controlled by the creative instructor. The intent is to involve the learner in activities that allow understanding and implementation of the by-words - **reduce, reuse, recycle** and **rethink.**

The activities are arranged to follow the conceptual framework in the appendix. The appendix also contains valuable background information related to a number of activities and should be examined carefully for concepts, information and support data.

Best wishes to you as you begin or continue on your journey with others striving for a healthy sustainable lifestyle.

Together we CAN make a difference!

Organization of "Iowa Clean SWEEP"

The Iowa Clean SWEEP program is designed to provide educators, K-12, with a series of activities focusing upon critical concepts about Iowa's solid waste problem. The program contains activities to create awareness, develop understanding, and motivate learners to action in moving towards a healthier environment for Iowa. Each activity may be used with a range of grade levels and the creativity of the teacher will determine the simplicity or complexity of the activity presentation.

The conceptual framework in the appendix provides an outline of the concepts addressed throughout the activity packet. Key concepts are as follows:

1. An overview, the finiteness of natural resources, and waste generation.
2. Current waste disposal practices and volume reduction.
3. Landfill problems and recycling.
4. Methods of reusing, reducing and recycling for waste management.
5. Waste costs and personal commitments.

The "Three R Classroom" in the elementary section provides an environment for an action-oriented solid waste program addressing reduce, reuse, and recycle. It is helpful to create this environment to facilitate the use of the activities.

Each activity includes the "My Little Bit" and "We Can Make a Difference" section, designed to initiate personal commitment. These two activity components represent the most important opportunities for learners to make improvements in the total solid waste scene in Iowa. We encourage the instructor to address these two sections of each activity, because they represent the real heart of each activity.

Tips on Usage of "Iowa Clean SWEEP"

Each activity is formatted for easy use and clarity. Most of the format headings are self-explanatory, however some tips may be useful.

"Time" - Time is based upon the estimate of time required to complete the procedure section of the activity. It may require additional time to do the "My Little Bit" section and "We Can Make A Difference" section, because these two elements may involve extended or ongoing activity.

"Background" is sometimes included for additional information considered useful for the success of the activity. More background information will be found in a separate section in the appendix.

Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
•Repaint • Rebuild • Reinvent • Recast • Return • Redefine
•Rejuvenate • Refashion • Remarkable • Recycle • Reuse •

Elementary Activities

Grades K-6

Reinvent • Recast •Return • Redefine • Rejuvenate • Return
Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
• Repaint • Rebuild • Reinvent • Recast • Return • Redefine •
Rejuvenate • Refashion • Remarkable • Recycle • Reuse •
Reinvent • Recast •Return • Redefine • Rejuvenate • Return
• Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
Repaint • Rebuild • Reinvent • Recast • Return • Redefine •
Rejuvenate • Refashion • Remarkable • Recycle • Reuse •
Reinvent • Recast •Return • Redefine • Rejuvenate • Return
Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
•Repaint • Rebuild • Reinvent • Recast • Return • Redefine •
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Reinvent • Recast •Return • Redefine • Rejuvenate • Return
Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
• Repaint • Rebuild • Reinvent • Recast • Return • Redefine •

Elementary Section
Order of Concepts

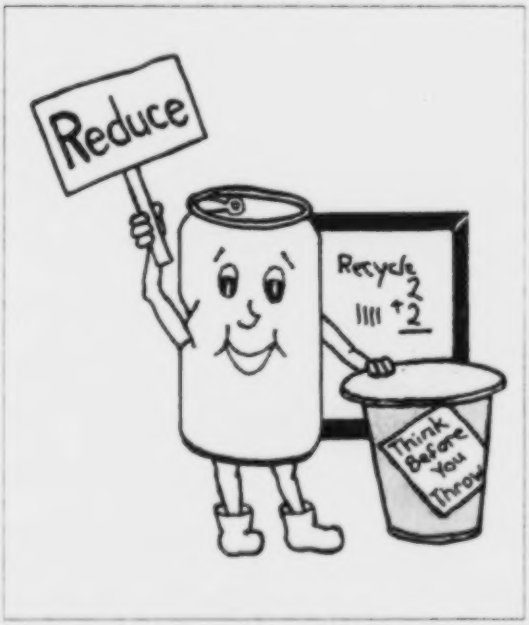
1. The planet has a finite supply of natural resources.	Musical Resources Back to the Future
2. Landfills are filling up and nonrenewable resources are being buried and made inaccessible for human use.	P.U. Dump Garbage Sleuthing
3. There is a history of garbage. Insurmountable problems with bulk of garbage containing non-renewable resources is part of current history.	Trash Flash Through Time Garbage Through the Ages
4. Many items can be recycled.	
PAPER:	Decomposing: The Everlasting Cycle From Trees to Paper. It's Slurry Time!
METALS:	Foiled Again Battling Batteries
PLASTIC:	From Petroleum to Plastic... to Plastic...
GLASS:	Glass in a Flash
5. We have everyday choices regarding the environment and our use of resources.	
PACKAGING:	Peanut Productions
LITTERING:	Litter Do We Know
REUSE:	Crayon Trash Stash
SORTING OUR TRASH:	A Sticky Situation
6. We need to be aware of what we are purchasing and the impact of our purchases (hidden costs) upon the environment.	Hidden Gremlins
7. It will take cooperation from all sectors of society to help us accomplish our goal of sustainable life on this planet.	The Recycle Hop

DESIGNING A RETHINK CLASSROOM

using the 3-R's

REDUCE REUSE RECYCLE

REDUCE



WASTE BASKET COVERS: Design a cardboard cover to fit over the waste basket so that one must THINK before throwing anything away.

Logo Suggestions:

"THINK before you THROW"
"YOUR TOSS is OUR LOSS"
"DON'T ABUSE IT IF YOU CAN REUSE IT"
"RECYCLE FIRST BEFORE I BURST"

Locate the scrap paper box and the crafts/odds and ends box next to the waste basket.

Encourage the use of pencils and erasers, computers, and the overhead projector so as to reduce paper consumption.
Encourage the use of scratch paper and the use of both sides of paper. USE BLACKBOARDS for working out math problems. Each student could use an individual mini-board whenever possible.

Magic slates also work well.

SECOND-HAND SHOP: Establish a system so the students can swap or obtain used items rather then buying new. Remember, "One person's trash is another person's treasure."

REUSE

Locate next to the wastebasket the following boxes:

SCRAP BOX: to hold scrap paper for assignments

ODDS AND ENDS CRAFT BOX: to hold craft items (yarn, foil, little boxes, ribbons, etc.) for art projects

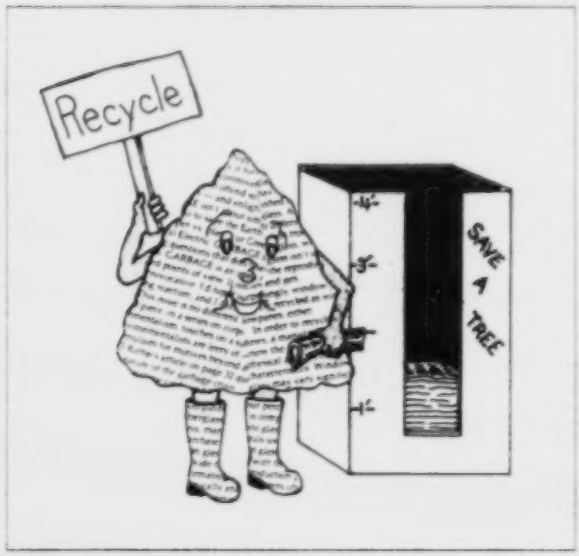
Designing a Rethink Classroom

COLORED PAPER BOX: to hold assorted colored papers for art projects

ENCOURAGE the use of the SECOND-HAND SHOP. Have students evaluate their own possessions and if they are not being used, perhaps another person might make better use of them. Establish a certain time and day when the shop would be open, perhaps during recess or lunch break. Rules for the second-hand shop:

1. Items must be clean.
2. Items must be small enough to be carried by hand.
3. A second-hand shop permission slip signed by a parent must be attached to all items.
4. All items must be labeled with the original owner's name.
5. All trading and taking of treasures must be done during shop hours only.

RECYCLE



TREE SAVER: Build or provide a four foot high bin (or use a tall narrow box) with a cut away window so as to watch the stack of paper grow. Pile in it all recyclable paper. A sign will be posted over the bin: "For every four feet of paper that is recycled, a tree is saved."
OR
Provide scales to weigh the paper that is recycled and keep a chart. "For each ton of paper that is recycled, 17 trees are saved."

FOREST: For every tree that is saved due to recycling, construct or design a tree for the classroom forest. The "forest" could be the quiet spot or the reading area of the classroom. The trees could have fall colored leaves in autumn, snowflakes in the winter, blossoms in the spring. (Made out of recycled paper!)

Construct a space in the classroom to demonstrate the volume of space taken at the landfill for each ton of paper thrown away. A **THREE CUBIC FOOT** area marked with crepe paper hung from the ceiling will demonstrate the volume of space taken up at the landfill for each ton of paper thrown away.

RECYCLE BINS: Set up collection bins for any items which can be recycled in the area. Encourage the cafeteria to also have bins. Students could take turns delivering the materials to the recycling center.

ADOPT A ROOM: Divide the students into small groups. Each group will adopt a classroom or a business. They will speak to the group about the necessity and importance of recycling. They will help the business or classroom establish recycling bins and will help develop a system for delivery to the recycling center.

EVERY CLASSROOM NEEDS:

1. An action network center where addresses, stamps, and envelopes are available so students can write letters applying pressure for better conservation practices.
2. An earth tips bulletin board where updated information and tips for a healthy earth are displayed.
3. A sign designating the classroom as a 3-R classroom so that all entering will know that the students and teacher within the room care and are doing something to help make the world a better place.

OBJECTIVE:

The learner will identify the natural resources consumed for the items used in daily life and will demonstrate the dilemma of finite resources and escalating human population pressures.

ACTIVITY IN BRIEF:

This activity is similar to Musical Chairs. Chairs represent natural resources and as they are depleted they are removed; however, everyone remains in the game and more people are added to simulate an escalating population. The participants must share chairs and balance on laps to demonstrate increasing stress on our continually diminishing supply of resources.

MATERIALS:

chairs to equal half the number of learners, 20 assorted objects (see list in procedure), and resource cards

GRADE: K-6

SUBJECTS: physical education, science, language arts

TIME: preliminary 30-45 minutes

GROUP SIZE: works best with 15 or more

SKILLS: classification, discussion, evaluation, kinesthesis, listening, listing, observation, public speaking, small group work, writing

VOCABULARY: renewable, nonrenewable, raw materials, bauxite, consumption, finite

CONCEPTS: Everyone produces waste. Some resources are rendered unusable. Each citizen can reduce the volume of waste she/he produces.

Musical Resources

PROCEDURES: Place twenty objects on the floor, (i.e., pop can, aluminum foil, perfume, plastic bag, paper sack, drinking straw, comb, pencil, bottle, paper clip, ruler, etc.) or have learners remove from their pockets or purses an item important to them. The learners will sit in a circle around the objects. Each learner in turn will choose an item and name the natural resource used to produce it. (NOTE: The leader may need to help with naming the basic raw materials used. See background in the appendix.) A list will be made of those natural resources named. Discuss renewable and nonrenewable. Circle all nonrenewable resources.

Next divide the learners into two groups. Half of the learners will become the people of the world (the players) and the other half will be the "unborn" people of the world (they will sit out and watch until they are "born" and called upon to play). See appendix for a song they could sing for the music.

Chairs will be arranged haphazardly to fill a large circular area representing the earth. (To start the game, there will be a chair for each beginning player.) Each chair will have a 4" by 6" index card of paper with a name of a resource printed on it. (i.e., Iron, Cotton,Petroleum, Wood, Bauxite, Silica) Some resources may have to be used more than once. The card will be sectioned into little squares. Some cards will have 3 sections, some 6, and some 8. (Vary the number.)

	IRON	

TWO CHAIRS WILL BE IDENTIFIED AS "WILD" (i.e., by tying ribbons on them). Each player will be given a crayon.

Tell the learners they represent the people of the world. The chairs represent the resources of the earth. When the music plays, the people will mill about the earth looking for natural resources to use for their daily needs. There are plenty of resources for everyone. When the music stops, everyone will find a place to sit. At this time, each player is instructed to tear off one of the little squares on the card where he/she is sitting to represent the consumption of that particular resource. The torn-off square is thrown in a pile behind chairs.

When the music begins, the procedure is repeated, again instructing the players to tear off a little square when the music stops.

Before starting the music again, tell the learners there are more and more people being born every day, so add three or four new members to the world's population. Begin the music; however this time when the music stops, there will not be enough chairs for each to have his/her own, so those left without one must find someone who is willing to share his/her chair seat or lap. Again, each person must tear off a box on the chair where he/she is sitting. Everyone must be sitting before the music begins again.

Repeat the procedure, adding additional players with each new round. The wild chairs are free - no boxes to remove! WHEN ALL THE SQUARES ON ANY ONE PAPER ARE GONE, THE CHAIR IS REMOVED FROM THE EARTH. (This is to represent the consumption of that natural resource. In this case, any or all occupants must move to the WILD CHAIR where resources are still available.) Continue this process until nearly all the chairs are gone, and all the learners are balancing several people deep on the two WILD CHAIRS.

QUESTIONS:

1. What would happen if the game continued and we kept on populating the earth and consuming our resources?

2. Was it sometimes difficult finding someone to share a chair or lap? (Do countries have difficulty sharing resources?)

3. How did it feel to be crowded on one chair? How did you feel when a resource (chair) was removed?

4. Is there a similar problem on our Earth? Are some nations using resources more rapidly than others? What resources are the closest to being depleted? (For speculation and discussion purposes.)

5. How could we alleviate the stresses on our natural resources? Make a list of ways to conserve our resources. (i.e. reducing consumption of gasoline, slowing global population growth, lowering the thermostat, using less hot water, rejecting the purchase of unnecessary items, and of course recycling whenever possible)

6. What does the WILD CHAIR represent? (unknown reserves of -resources)

7. What does the pile of "resources" on the floor represent? Now cover the discarded squares with a coat, sweater, or blanket to demonstrate what often occurs in a landfill and ask the learners to express their feelings about this process.

Divide learners into small groups and give each group the name of one of the resources. Each group will make a list of actions people could take to conserve that resource. Share the ideas with the large group.

MY LITTLE BIT: I will choose one item from our list that I do not already do, and I will practice it for a week. I will challenge myself to make it a habit.

WE CAN MAKE A DIFFERENCE: We will make a large cutout of the earth to display on a bulletin board. Our leader will have available little colored dots; each color representing a different resource (i.e., yellow for petroleum, green for wood, etc.)

Each week we will volunteer to stand up and tell how we conserved a resource during the past week, and we will receive a colored dot representing the resource we conserved to stick on our earth. (The dot may be placed where that resource is found.)

EXTENSIONS: Play musical resources again, but this time when a player reaches the chair, allow him/her the option of stating a way the resource can be recycled or conserved. If the player can think of a way to conserve, not consume, the resource, the boxes will not have to be filled in. The game can go on indefinitely when the resources do not have to be consumed.

One person could be chosen to represent the U.S.A. The U.S.A. uses over 20% of the world's resources, so the U.S.A. could always have first chance at a chair and would not have to share. How do the others feel toward the U.S.A. in this game?

Discover where the reserves of petroleum, bauxite, tin, etc. are located and place them on a world map. Choose an item and research where the raw materials (natural resources) come from. (See appendix background.) Be sure to include the energy needed to produce the item.

Find out how much energy is saved when an item is recycled instead of being made from new resources.

EVALUATION: The learners will name 10 items used daily and trace them back to their original natural resources.

BACKGROUND: Our natural resources are truly finite. We face the challenge of declining resources. We must reduce our rate of use to make these resources last and we must recycle whenever possible.

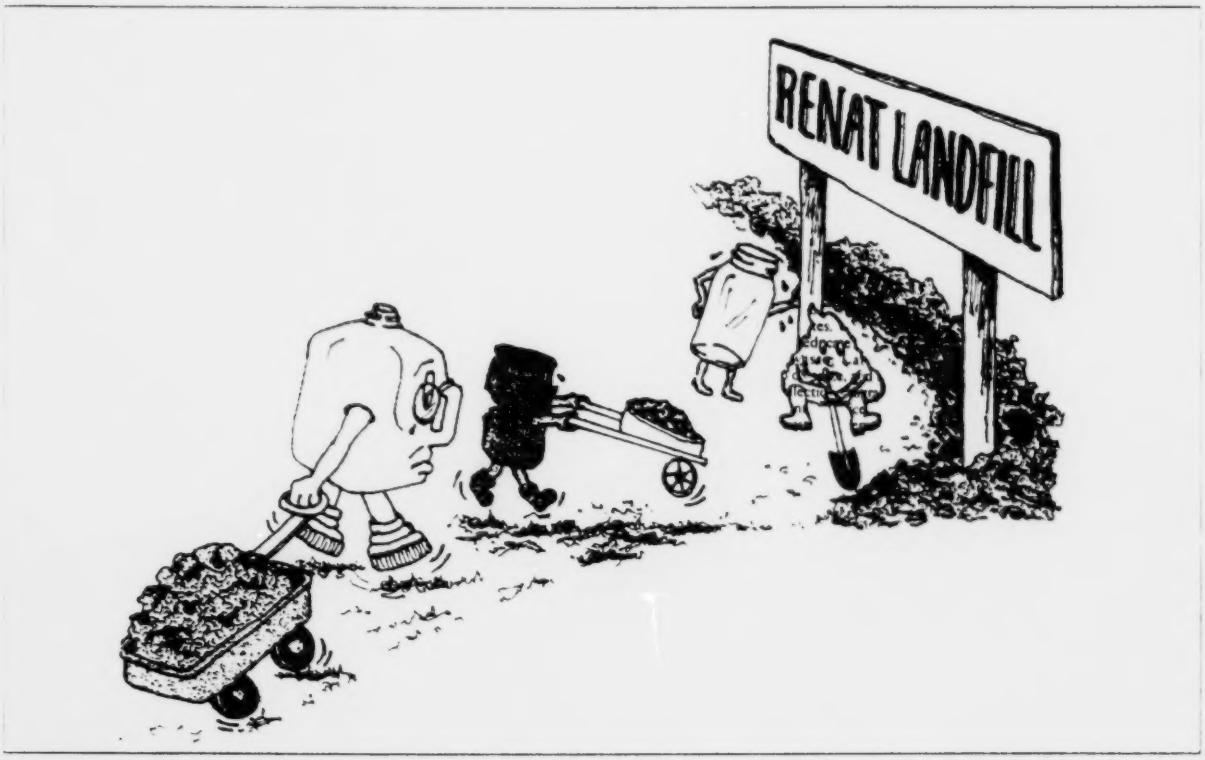
In the 6 seconds it takes you to read this sentence, 24 people will be added to the Earth's population.

Before you've finished this letter, that number will reach 1000. Within an hour... 11,000. By the day's end... 260,000.

Before you go to bed two nights from now, the net growth in human numbers will be enough to fill a city the size of San Francisco.

It took four million years for humanity to reach the 2 billion mark. Only 30 years to add a third billion. And now we're increasing by 95 million every single year.

No wonder they call it the human race.



OBJECTIVE:

The learners will explain the importance of recycling our natural resources, and they will list the materials which can be reycled in their area.

ACTIVITY IN BRIEF:

The learners will participate in a simulation pertaining to the accumulation and usage of the earth's natural resources. They will then discuss the problems arising from the unequal and wasteful usage of our natural resources.

MATERIALS:

2# coffee cans, large sock, 2 cups assorted colors of buttons, 8 cups, pebble size rocks, M & M's (large package), landfill sign, measuring cups

GRADE: 4-6

SUBJECTS: social science, math, science, geography

TIME: 1-2, 69 minute periods

GROUP SIZE: any size, divided proportionately into 6 continents (see chart)

SKILLS: application, discussion, synthesis, organizing

VOCABULARY: natural resources, landfill, technology, conserve, recycle, soda lime

CONCEPTS: The current process of discarding materials to a landfill does not restore useful materials to the people on planet earth.

Back to the Future

PROCEDURE: The learners will be divided proportionately into the major continents of a fictitious world.

Continent	Population of P-3 (% of Total)	Resources used yearly (% of total)
H. Tron	8%	39% (1 cup)
H-Tuos	6%	8% (1/4 cup)
Eporue	14%	24% (3/4 cup)
Aisa	61%	18% (1/2 cup)
Acirfa	10%	8% (1/4 cup)
Ailartsua	.5%	3% (1/8 cup)

A two pound coffee can or a bag will be filled with buttons and small rocks which will represent various resources. There should be more rocks than buttons. Each color of button represents a resource. Display the following chart:

Color of Button		Resource
Yellow	=	Petroleum
Brown	=	Coal
Red	=	Natural Gas
Green	=	Trees and other plants
Silver	=	Aluminum
Gold	=	Precious Metals
Pink	=	Sodium Bicarbonate
Black	=	Tin
Tan	=	Iron
Rocks	=	Land

The can will represent the unknown reserve status of the resources of the world.

Tell the learners that they will represent the entire population of the planet H-Trae. Each continent must obtain the natural resources necessary for their survival. Each continent has a different size of container (refer to the cup sizes for each continent) with which to obtain these resources. The difference in the size is due to the differences in the amount of power, money and/or technology possessed by each particular continent.

1. A representative from each continent will dip out its yearly share of resources from the can.
2. The people of the continent will "use" the resources. They will:
   (1) Return the rocks (land) to the can.
   (2) Keep a tally of all the resources obtained. Red, yellow, brown, or green buttons can be exchanged for food (two M&Ms per button), since petroleum, natural gas and coal are the energy sources used in the production of food (plants). HOWEVER, EACH CONTINENT MUST RETAIN AT LEAST ONE RED, YELLOW, OR BROWN TO BE USED AS ENERGY SOURCES OF OTHER PRODUCTS. In other words, if two green buttons are extracted, only one can be exchanged for food.
3. Decide as a continent how to distribute the "food." (M&Ms)

Discuss the uses of the remaining resources. How will they be used? (aluminum, iron, and tin for containers; trees for packaging; sodium bicarbonate for glass production; petroleum for the production of plastic and for the energy source in the production of countless products)

Now, tell the learners that we will demonstrate the utilization of the resources by discarding the resources (buttons) in the designated landfill. This includes all the remaining red, yellow, or brown energy sources along with gold, silver, tan, black, or pink.

The above process will be repeated two more times. But on the second time, the price of energy and food will increase because petroleum, natural gas and coal are becoming more scarce. Therefore, only ONE M&M can be exchanged for each energy or food source.

QUESTIONS:

1. What will happen to the resources in the reserves if we continue this process? (i.e., we will eventually run out; there may be conflicts with the more technologically advanced continents "winning"; more powerful continents may try to gain the resources of less powerful continents through trade, agression, etc.)
2. What can be done to stop the waste of these resources? Make a list. Examples:
   - recycle whenever possible
   - use less energy (It takes less energy to recycle than to produce new products from raw materials.)
   - reduce unnecessary packaging

Repeat the activity one more time, except this time all the extra energy and all the recyclable resources can be returned to the can, if the continent decides to conserve and recycle.

QUESTIONS:

1. How did you feel about the unequal accessibility of the resources? Discuss the "fairness" of the situation.
2. How did you feel about returning the resources to the can so they could be used again?
3. How much longer could we extend the process if we recycle? What will happen if the population increases? Will it become all the more necessary to recycle?
4. Should the development of renewable energy sources (solar, wind, geothermal) be increased because of the finite status of coal, natural gas and petroleum?

NOW tell the learners that they were actually simulating the situation on the planet earth. (H-Trae in earth spelled backwards, and the imaginary continents spelled backwards designate the counterparts on earth.)

Substituting all the real names, display the chart showing the distribution of population and resource use on earth. Scoop out North America's share of the resources and let the learners speculate how much of this is actually recycled on earth. (Only 40% is recycled. 60% of the used resources end up in the landfill.) Let them see you throw away 60% of the resources.

QUESTIONS:

1. What are YOU doing to conserve the earth's resources?
2. What resources can be recycled in your area? How do the materials need to be prepared for recycling? (Invite someone knowledgeable about recycling to visit with the group.)

MY LITTLE BIT: I will help organize a recycling program in my home. I will prepare and sort all recyclable items and will help deliver them to the recycling center.

WE CAN MAKE A DIFFERENCE: We will organize a recycling system at school, and we will adopt a business and help them organize a recycling program.

EXTENSION: Develop and distribute "How to Recycle" information to the school administration, neighbors, local businesses, community centers, or the media. Hold an all school assembly complete with skits and talks given by the

learners about the importance of recycling.

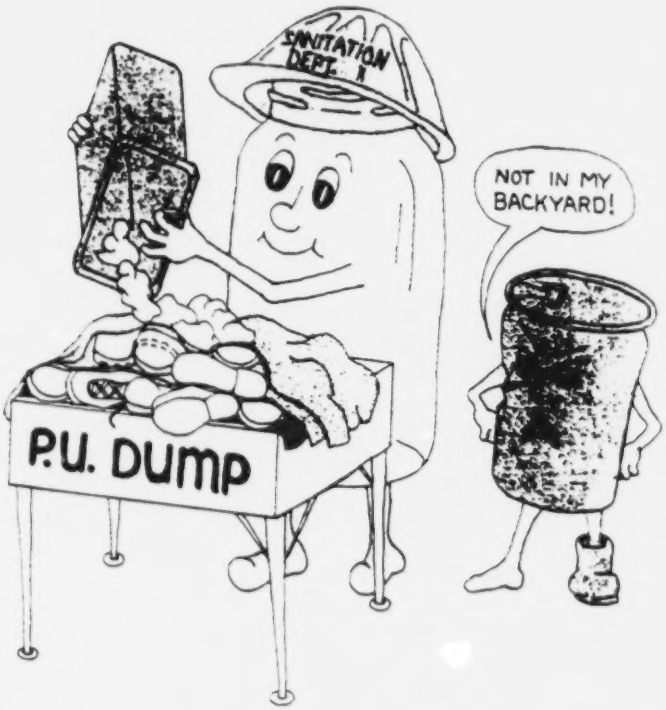
Learn more about the local landfill's capacity. What are the plans for the future when the current landfill is filled?

EVALUATION: The learners will name all the resources which can be recycled. They will make a statement as to why it is necessary to recycle whenever possible.

P.U. Dump

OBJECTIVE:

The learners will be able to describe the qualities of an open dump and a sanitary landfill. They will relate the problems associated with land availability, water quality, and wasteful buildup of natural resources.



ACTIVITY IN BRIEF:

The learners will first create an open dump, then a sanitary landfill with their shoes and other classroom trash. They will become landowners and other characters in a simulation which demonstrates the NIMBY (Not In My Back Yard) phenomenon. Then, after analyzing their family's waste stream, they will prepare a plan to reduce it.

MATERIALS:

stickers on the back of 1/3 of the desks or chairs, learners shoes & desks, assorted trash, Mayor's letter, coupons for special privileges (see activity), bathroom scale, 3 garbage bags

GRADE: 3-6

SUBJECTS: language arts, social science, science

TIME: 45-60 minutes

GROUP SIZE: any size

SKILLS: analysis, computation, description, discussion, listing, writing, problem solving

VOCABULARY: sanitary landfill, "NIMBY", impermeable, leachate, open dump, toxic, hazardous waste

CONCEPTS: Landfills are the most common method of disposing of waste. There are many problems related to landfills.

P.U. Dump

PROCEDURE: All the learners will become residents of a fictitious town. After deciding on the town name, each learner will file a property deed by signing his/her name and desk location (row and seat number) on a piece of paper and placing it in a container at the courthouse. (One's property is one's desk.)

Before the simulation begins, place a piece of masking tape on the back of a random one third of the desks or chairs. This will distinguish properties which meet the requirements to be eligible for landfill sites.

From the courthouse files, draw out the positions of mayor, mail carrier, real estate agent, dump site operator, and landfill operator. There should also be one sanitation worker for every 10 residents.

Each learner will receive a real estate appraisal for his/her property. Some sections of town will have higher valuations than others.

NOW YOU CAN BEGIN P. U. DUMP!

1. Each learner will remove one shoe and place it on top of his/her desk. (They are taking out the trash and depositing it along the curb.) Write on a piece of scratch paper the names of three items which will be thrown out with the trash. The paper will be tucked inside the shoe.

2. The appointed sanitation workers will collect the shoes on their pre-arranged route and take them to the open dump. The open dump is located on top of the dump operator's desk.

3. Make a list of adjectives and phrases that describe the dump (ugly, smelly, takes up space, unpleasant to be near, etc.). It is also "useless", and the dump operator can no longer "study" there.

4. Allow residents surrounding the dump to put their property up for sale by exchanging desks. If no one wants to exchange their property, then the value of all property immediately surrounding the dump will go down and the property value of the remaining desks will go up.

5. Now make a list of the types of trash or garbage (food scraps) that might be found in the local dump. Is any of this garbage dangerous (toxic, hazardous) to the environment by leaking through the ground and into the underground water supplies? Could any of it pollute the air? What could be done to help solve these problems?

6. At this time, the mail carrier will deliver a letter (see handout) to the mayor who will read the dump violation notice. Since the dump must be closed immediately, the town must buy additional land so a new town sanitary landfill can be constructed.

7. The real estate agent must find a willing seller. The agent is authorized to offer the landowner who is willing to turn his/her property into a landfill a fair market price for the property. However, only those properties which have been identified with a sticker will be eligible to be considered as a landfill site because certain requirements must be met (soil type,surrounding watershed, etc.). Encourage neighboring landowners to consider the effect upon surrounding land values in the event a landfill were to be constructed. At this time the neighbors can try to influence the landowner NOT to sell the property for use as a landfill site. (They may even attempt to

unite by outbidding the agent's offer and offering the seller money out of their own pockets if the seller refuses to sell-out.)

[If no one is willing to sell, the mayor will in this simulation declare whose propety will be sold for the good of the public and will give the seller fair market price for the property. The seller will become the new landfill operator.]

8. The landfill operator must prepare the landfill site by laying a piece of plastic, like a garbage bag, over his/her desk to simulate the clay and/or plastic lining.

9. Residents will take off their second shoe, tuck another slip of paper inside and place it on the curb (desk top) to be picked up by the sanitary workers. The landfill operator will compress and cover each sanitation worker's load of garbage with at least 6 inches of dirt (another piece of plastic) . This must be done to fit the required code pertaining to landfills.

[Again, those residents whose property is NOT adjacent to either solid waste site will receive a higher appraisal than the owners of the properties surrounding the sites.]

10. Appoint a sanitation worker to empty the classroom wastebasket on the pile. This is also covered with dirt (a piece of plastic) by the landfill operator. If any trash falls to the floor, the landfill is considered full and must be closed, a problem many communities are facing. (A landfill is considered full when it reaches a grade of 3 to 4 feet with a capped layer of clay and then sod.)

Continue the simulation as long as interest and motivation is high.

QUESTIONS:

1. Where is the location of the landfill closest to your community, and what is its lifespan?
2. Where will your community put its solid waste when the present landfill is full? Will the residents say, "NOT IN MY BACK YARD!" (The NIMBY phenomenon.)
3. How would you feel about other states bringing their waste to your state? (What about sending waste to other countries?)
4. Can anyone really say, "It's not my problem."? Whose problem is it?
5. How can solid waste be reduced? How can we cut down on the waste produced (1) at school, and (2) at home? Make two lists.

MY LITTLE BIT: I will keep a chart of the family's weekly waste (by weight). I will write and share with my family ways we, as a family, can reduce our waste. (The success of this project will be determined by any weight reduction in the family's waste over the duration of the project.)

WE CAN MAKE A DIFFERENCE: We can keep a record of the total pounds of waste thrown away in a week. We can challenge ourselves to see a reduction in pounds of waste thrown away weekly by implementing as many of the ideas generated in our class list as possible. We can shoot for a goal, and celebrate when we reach it. (Idea: Make garbage can shaped cookies and eat them to symbolize the reduction of size needed in our garbage cans for our waste.)

EXTENSION: Invite someone from the local waste disposal commission to speak to the group regarding methods and future plans for solid waste disposal. What is the life expectancy of the current landfill, and what will

become of it after it is filled and closed? Divide the learners into groups and let them draw plans or make a model of how the land will be developed after the landfill is closed.

EVALUATION: The learners will draw a picture of a landfill and an open dump to contrast the differences. They will draw and cut out a shape of a garbage can and will print on it three ideas of how to reduce waste.

Solid Waste Management
Department of Natural Resources
Wallace Building
Des Moines, IA 50319

Dear Mayor:

It has come to the attention of the Department of Natural Resources that your open dump is in violation of Iowa Code 455B.307 passed in 1971 which states that all open dumping in the State of Iowa be forbidden. We urge you to begin in a timely manner to dispose of your solid waste material lawfully or be prepared to receive severe penalties.

Urgently Yours,

U.R. Initbig

Department of Natural Resources

BACKGROUND: Today's sanitary landfills are much different from the open dumping grounds of the past. In Iowa, laws regulate the ways landfills may be operated.

After thorough studies of the soil types, bedrock, and water movement through an area, a landfill location may be approved for development. The land must be prepared to hold the garbage and that usually means scraping away soil to form a deep hole, called a cell, and a series of pipes for monitoring laid below a clay liner (most common method in Iowa) or a plastic liner. These preparations and studies are very expensive so it is advantageous for each approved landfill to last as long as possible.

Each day that garbage is dumped in the hole and compacted, it must be covered at the end of the day with six inches of dirt. That prevents light weight materials from blowing around, keeps away rodents, reduces odors, and eliminates the possibility of wildlife populations from artificially surviving on the garbage which could harm them. Well-run landfills may add other rules to help them maintain a neat appearance such as refusing loads on very windy days, or they may cover each load that comes in to be dumped.

Garbage is added to the hole and covered to a preapproved height and slope so erosion doesn't expose the garbage to the surface. When a cell is filled and finally covered and finsihed, the operators must continue to monitor the groundwater through wells in the surrounding area. Iowa law requires those cells to be monitored for thirty years, so adequate funds to pay for the monitoring must be considered part of the cost of landfilling.

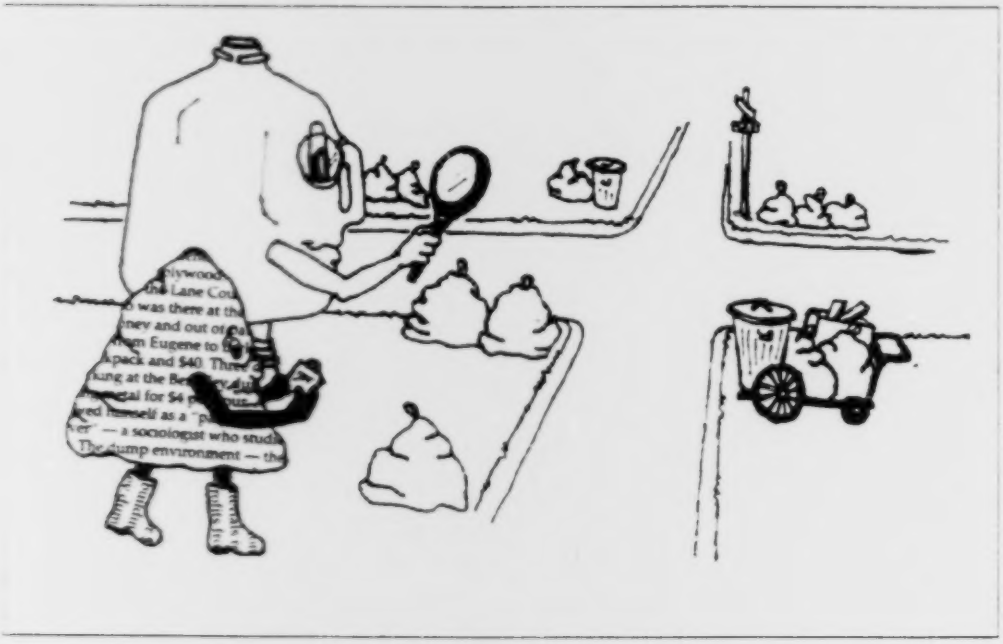
Because none of the current alternatives to landfilling stops waste entirely, some landfills will continue to be needed. However, fewer local landfills may be needed.

More information about regulations for landfills and solid waste may be found in the 1987 Groundwater Protection Act and a 1989 bill for waste volume reduction and recycling.

EPA Estimates

The Environmental Protection Agency estimates that at least 50% of all U.S. landfills will close within 10 years... some are filled to the brim, others must close due to EPA charges of contamination to air, soil and ground water.

Garbage Sleuthing



OBJECTIVE:

The learners will analyze their family's waste stream and will devise a method for reducing it.

ACTIVITY IN BRIEF:

The learners will keep daily records of the types and amounts of items thrown away by their family during a typical week.

MATERIALS:

box of used paper, 10-15 sheets per learner

GRADE: K-6

SUBJECTS: language arts, social science, science

TIME: 60 minutes, excluding home garbage study

GROUP SIZE: 10 or more

SKILLS: listing, reporting, researching, analyzing, application

VOCABULARY: landfill, waste stream, disposal, recycling

CONCEPTS: Everyone produces waste.Citizens as well as municipalities have responsibilities for waste management.

Garbage Sleuthing

PROCEDURE: Tell the learners, "The governor and lawmakers of Iowa recently passed a law requiring landfill operators to reduce the amount of garbage coming into the landfill. In order to do this, an investigation needs to be conducted regarding the throw-away habits of the people of the community. You have been chosen to help with that investigation."

Give each learner an official garbage detective badge. The first thing a detective must do is to make assumptions. Have the learners make an assumption about the average household's garbage. What does the typical bag of garbage contain? Make a list. In what proportion are these items found? List an order. Consider the following:

Glass Tin Aluminum Paper Food Plastic

Now it's time for the investigation. Each detective will keep a record of his/her household garbage for one week. This is how it will be done:

1. Explain the investigation assignment to the family members and politely ask for their cooperation. (See letter.) Ask the family members to put all their trash in pre-determined collection areas to help make the job easier.
2. At the end of each day, empty the contents of the waste containers onto a large sheet of plastic (in the garage or yard for mess control).
3. Wearing gloves, separate the garbage into categories (plastic, glass, paper, food, tin, aluminum, other). Then count and/or weigh (if a scale is available) each category. Keep a record. TAKE SPECIAL PRECAUTIONS HANDLING CANS, GLASS, ETC. If recycling is being done, keep a separate chart for these items.
4. Be sure to return all trash and recyclable items to appropriate areas.

After a week (time may vary) the detectives will present their findings and will write a summary of their research.

1. What kinds of things did your family throw away?
2. Were you surprised at the amount that was thrown away? Explain.
3. How did your findings compare to the findings of others?
4. Were items thrown away which could have been reused or recycled?

Discuss ways in which the "garbage stream" could be reduced. Write a letter to send to the landfill operator with recommendations on how to reduce the amount of trash coming to the landfill each year.

Give each detective a certificate of appreciation for his/her work on the investigation.

MY LITTLE BIT: I will choose one action I could take to help reduce the waste stream. I'll write the commitment on a piece of waste paper and hand it to the "safekeeper" (teacher?). These are private and no one (not even the teacher) will read them.

After three weeks or more, return the commitments to the learners. Discuss the difficulties encountered, successes and failures with those willing to share. At the back of the room, have two containers, one marked "RECYCLE" and the other marked "GARBAGE." Discretely, have each learner drop the commitment into the appropriate container. Successful ones go in the "RECYCLE" container and unsuccessful ones go in the "GARBAGE" container.

Repeat the above activity to give the opportunity for increased success.

WE CAN MAKE A DIFFERENCE: We will

ask the local newspaper and/or radio station if we can present one idea per week on how people can reduce their waste stream. This could become a very influential public service.

EXTENSION: Invite someone from the local garbage collection agency to speak to the group. Ask a representative from the city council or the solid waste commission to come and talk about local landfill ordinances. Visit the landfill!

Learn about the "garbage scientists" who study the compostion of landfills. What have they learned about decomposition in a landfill? What have they learned about our society? (Compare them to archaeologists who study past civilizations and their cultures by digging up their ruins.)

EVALUATION: The records of family garbage kept by learners can be used as an evaluation tool. The learner could also state one action that could be taken to reduce the waste stream.

BACKGROUND: The average American throws away 3.5 to 4 pounds of waste daily. It may be "out of sight", but it doesn't disappear, and the waste continues to grow and deplete landfill space.

The average life of a landfill is 15 years. One third of the active landfills in the United States will be full within 5 years.

Letter to Parents:

Dear Parents:

For a project on waste management, your child has been assigned to record the amount of glass, paper, aluminum, tin, plastic, and other items which a typical household (that's you!) throws away or recycles in a week's time.

If the assignment interferes with family activities or in any way becomes a problem, feel free to make adjustments to the activity or to discontinue it.

Thank you for your cooperation in this learning experience!

Sincerely,

Our environment is in trouble. A hole in the ozone layer, shrinking forests and overflowing landfills are threatening Mother Earth. People created these problems. Now it's time for people to do something about them.

The Council for Solid Waste Solutions

Trash Flash Through Time

OBJECTIVE:

The learner will be able to explain how solid waste has been dealt with historically and why there is a solid waste problem in modern times. They will be able to state how they could recycle at home and at school.

ACTIVITY IN BRIEF:

Through guided imagery and interviews with older generations, the learner will examine recycling of the past and will compare this to recycling today.

MATERIALS:

writing materials

GRADE: 4-6

SUBJECTS: social science, language arts

TIME: 30-45 minutes, excluding survey

GROUP SIZE: any size

SKILLS: interview, discussion, listening, research, writing

VOCABULARY: recycle, reuse

CONCEPT: Waste disposal hss been and still is an ever increasing timeless dilemma. Each person can reduce the volume of waste he/she produces.

Trash Flash Through Time

PROCEDURE: The learners will participate in a guided imagery by getting in a comfortable position, closing their eyes, and listening carefully to the following simulation:

"You are walking through a quiet, beautiful forest. You feel happy to be in such a peaceful, lovely place as this. You come to an opening under the canopy of leaves, and in the rays of sunshine you see a strange and unexpected sight. It looks sort of like a car, sort of like a thing one would ride at a carnival. It looks like a whole lot of fun, whatever it is, so you open the door and step inside a most miraculous little room.

There are lights, buttons, levers, graphs, clocks, dials, calendars, and computer screens and you know at once this is a time machine!

Carefully following the instructions on the screen, you fasten your safety belt, set the clock in reverse, and wait as dials spin, buzzers sound, and you feel yourself being thrust back into your seat. On the big screen above, you see events in time come to life; the first trip to the moon, World War II, George Washington crossing the Delaware, the Nina, Pinta and Santa Maria heading westward. Wait! It's going too fast! You've got to stop this thing! Your finger finally finds the stop button. Year 1250 flashes above. OOF! It stops! The door slowly opens behind you.

It is a misty morning on a cobbled street in London, England. The clopping hooves of a horse drawing a cart can be heard in the distance. Squealing little piglets are being joyfully chased by children running all about.

SPLASH! PLOP! Out of an open window two stories up comes a shout, "Gardy-Loo!" followed by a heaving of a bucket of garbage. Vegetable peels and table scraps fall right onto the street below. It barely missed you! And now here come the pigs, rushing to the scene to investigate the tasty morsels they might eat. WOW! You can't believe it is actually like you read about in the history book. People throw their garbage out their windows and onto the street. Pigs run freely about to eat whatever is edible.

"Gardy-Loo!" Oh! No! You hear it again! Running, ducking, and jumping over slippery, slimy garbage, you head back to the time machine, set the time back to the present, and find yourself being flung forward in your seat, stopping at the date and year when you first found the time machine.

Whew! What a trip! The door slowly opens behind you, but you remain seated as your mind continues to spin with the memory of your adventure.

All the garbage! Whew! It's good to be back home. You can open your eyes now, but stay in your THINK mode as you consider these questions:

1. What was the garbage which was tossed out the window and onto the streets of London 700 years ago? (Were there cans, glass, paper, aluminum, plastic containers, food and human waste?)
2. Describe their method of disposing of garbage 700 years ago.
3. What is the composition of modern day garbage? (food and yard waste, paper, aluminum, tin, glass, cardboard, plastic)
4. What is our method of disposing of garbage?
5. What do you think was the first attempt at recycling? Did your grandparents recycle? How can we find out?

Maybe we can learn something about reusing or recycling from past history. Our grandparents and their parents recycled or reused many materials that are commonly thrown away

today. Let's discover some of the things they did then that we can put into practice today so that we can better protect our earth's natural resources.

Give the learners the survey (see handout). Tell them to listen carefully to the stories. Remind them to tell the interviewee how much you appreciate the interview, and how valuable their stories are to our research!

Allow enough time for the learners to conduct the interviews.

QUESTIONS:

1. What items did your grandparent recycle?
2. How did your grandparent conserve resources?
3. What materials were used for packaging then?
4. How did your grandparent keep food items from spoiling?
5. Make an "I learned....." statement regarding your grandparents use of resources. Be sure to write a thank-you note to the person interviewed.

MY LITTLE BIT: I will write a message to my unborn grandchild stating how I will be careful about conserving resources (and land) so that this unborn child will inherit a better world.

WE CAN MAKE A DIFFERENCE: We will make a class "will" on a long piece of paper. It will contain a list of resources which will be passed on to future generations. Accompanying the list will be statements describing how this will be accomplished, followed by the signing of everyone's name.

A picture could be taken for the newspaper of the "will" with everyone standing around it. Or the "will" and a photo of everyone could be displayed where many people will see it.

EXTENSION: The learners will hold a TIMES PAST RECOGNITION DAY and will live one day as their grandparents would have. Invite the media (newspaper, television) to come and take pictures and help tell the story of how we can learn some of the good conservation practices of the older generations.

Invite two or three senior citizens to share stories about what life was like when they were students in school. Talk about garbage, things thrown away, things recycled, things reused, material possessions, etc..

Use the "GARBAGE SHUFFLE" from Ranger Rick's Naturescope: Pollution. This rap is a neat tie-in and is fun for the kids. It could be presented to a greater audience.

EVALUATION: The learners will write an essay about what they learned by interviewing their grandparents.

Trash Flash Through Time

OLDER AND WISER SURVEY

We are conducting interviews with the older generations so we can learn how people handled their garbage and resources in the past. Your stories are valuable to our research. Thank you for agreeing to do this interview.

Please answer all of the questions for the time period when you were my age.

1. What is your full name?_____
2. Where were you born?_____ When?_____
3. What was the year when you were my age? _____
4. Did you have any spending money?_____
5. How did you spend it?_____
6. What did you do for fun in the summer?_____
   In the winter?_____
7. How old were you when you got your first T.V.?_____
8. What chores did you do?_____
9. How did you get to school?_____
10. What did you play with your schoolmates at recess?_____
11. What toys did you buy?_____
12. What toys did you make?_____

FOODWAYS

13. Did you grow your own food?_____
14. How was your family's food kept fresh?_____
15. How did store-bought food come packaged?_____
16. What did you do with the package or container when it was empty?_____
    _____
17. What did you eat at school?_____
18. Did you carry your lunch?_____ In what containers?_____
19. If you brought food home from a restaurant, how was it packaged? (was paper or polystyrene used?)
    _____

PAPER

20. Did you own your own:
    Magazines?_____ Newspapers?_____ Books?_____
21. What did you do with old papers, magazines or books?_____
22. Did you use paper (if not, explain what you used instead):_____
    Napkins?_____

Tissue? _____

Towels? _____

23. Did you receive junk mail? _____

24. Did stores provide paper shopping bags? _____

GLASS

25. What types of glass containers did you have? (jars, soda bottles, milk bottles, etc.) _____

_____

26. Did you throw them away, reuse, or recycle them? _____

ALUMINUM

27. Did you have aluminum? _____ For what uses? _____

28. Did you throw it away or recycle it? _____

TIN CANS

29. What kinds of food did you buy in cans? _____

30. What did you do with the cans when they were empty? _____

CLOTHES

31. Did you buy your clothes or make them? _____

32. What did you do with outgrown clothing? _____

_____

33. What did you do with worn out clothing? _____

_____

PLASTIC

34. Were there plastic containers? _____ What came in them? _____

_____

35. What was in your first plastic bottle? _____

TIRES

36. What happened to worn out tires? _____

GARBAGE

37. Where was your garbage thrown? _____

28. What was recycled? _____

FINALE

39. Do you still have some things from your childhood? Explain: _____

_____

40. When you were a child, did you worry about the world's resources? _____

_____

Trash Flash Through Time

41. Did people talk about recycling and conserving resources then?_____

42. How do you think people today have changed in their attitudes?_____

43. Would you rather be a child in today's times or the times when you were a child? Explain:

Garbage Through the Ages

OBJECTIVE:

The learners will perform a skit dealing with garbage through the ages.

ACTIVITY IN BRIEF:

The learners will participate in a rap about the history of garbage disposal through the ages. A timeline will be developed to express the value of recycling and/or reduction and precycling.

MATERIALS:

long roll of newsprint, markers, costumes as needed

GRADE: 4-6

SUBJECTS: social science, language arts

TIME: 2-3 hours.

GROUP SIZE: 9 groups of 3

SKILLS: drawing, public speaking, interview, media construction, psychomotor development, writing, small group work, predicting, mapping

VOCABULARY: natural resources

CONCEPTS: The types of garbage and methods of disposal have changed through the ages.

Garbage Through the Ages

PROCEDURE: The learners will be divided into 9 groups. Each group will have a portion of the skit to read. They will have time to plan the execution of their part. They also will gather the necessary props.

Designate a prompter to direct the order (perhaps a number card could be held). As the skit progresses, each group throws more "garbage" in the middle of the room creating a huge pile for the finale.

Here is the skit:

Group 1
This is the story of the his-to-ry
Of people much like you and me
They have a problem, as you will soon see
What to do with their throw a-ways!

ALL
Garbage! Garbage! It's just a bunch of trash!
Simply toss it, or bury it, or burn it into ash!

Group 2 (Monkey-like tree dwellers, 90,000 B.C.)
We're a lot like people. We live in a tree.
We get rid of garbage so easily!
It's a snap of the finger, a flick of the wrist
Down to the jungle floor. Do you get the jist?
(Banana peels, apple cores, etc. get tossed to the floor)

ALL (Repeat Chorus)

Group 3 (Cave Dwellers, 50,000 B.C.)
We are the cave dwellers, and what do we do with the garbage we make like the bones we chew?
There aren't many people, our tossouts are few.
We don't have landfills. Look at our view!

ALL (Repeat Chorus)

Group 4 (Roman, 200 B.C.)
We are the Romans. We live in town.
It's against the law to throw anything down!
A mile away from the edge of the city
Is a pile of junk that isn't so pretty.

ALL (Repeat Chorus)

Group 5 (British, 1200 A.D.)
We are from England. We're in a stew,
and up to our knees in fly infested goo.
When housewives shout out to the pedestrians below,
"Gardy-loo!" Don't look up! It's headed straight to you.
Then here come the pigs, a squealing with glee
To garbage filled streets where meals are always free.

ALL (Repeat Chorus)

Group 6 (Settlers, 1630)
We are the settlers. We came with very little.
We make our own things, like this spoon which we whittled.
We reuse items which we had pre-vi-ous-ly built
Bent nails will be straightened. Cloth scraps into quilts!

ALL (Repeat Chorus)

Group 7 (Colonist, 1700)
We are colonists. We have lots more stuff.
We trade with other cities, life's not so tough.
Items are skillfully crafted; handmade with quality and style.
The trash we do not want any more, we throw into a pile.

ALL (Repeat Chorus)

Group 8 (Industrialist, 1900)
We love things - lots of things - all sparkling, clean and new
When our Chevrolet gets rust, we buy a Subaru!
We surround ourselves with luxury. Oh! The things we throw away!

Polystyrene cups and plates we use up in one day.
Pretty packages with colors, advertising with style and form,
Piling up in the landfill space? There's got to be a way!
We'll stash our trash in the neighbor's backyard or dump it in the bay.
We'll burn our trash to ashes; never to be seen again
Out of sight, out of mind...no one will we offend!

ALL (Repeat Chorus)

Group 9 (Caretakers of the land)
Stop! We cannot stand it! You're making us feel sick!
The resources we have remaining are at the end of their wick.
You're fouling up the skies with deadly gases and smoke.
Ruining water, land, and air. I think I'm going to croak!

ALL Groups 1-7

They're right! Your resources are quickly shrinking away.
Changes better be made NOW or your future is looking gray.
Return what you use, or don't use it at all.
Recycle those resources. You'd better not stall!
Don't toss them or trash them or burn them to ash.
Rethink what you're doing with the stuff you call trash!

Develop a mural-type timeline of the history of garbage. Divide the learners into small groups. Each group will develop the artwork and graphics for a particular segment of time. More research will need to be conducted to supplement facts already known. Each group will report their new findings. The timeline could be displayed in a long hallway.

Garbage Through the Ages

MY LITTLE BIT: I will make a sign to hang over our garbage at home reminding my family to "Rethink what were doing with the stuff we call trash."

WE CAN MAKE A DIFFERENCE: We will submit a plan to reduce waste, protect natural resources, and create a healthier environment to the city government for their consideration. The local radio and/or newspaper will feature a story about our hopes and dreams for the next hundred years.

EXTENSION: The learners will conduct interviews with parents and grandparents regarding garbage management past and present. What are differences in the amount and kind of garbage? What can be concluded about the garbage situation today?

Garbage Interview

The year my parent was my age: (19 ———)

The year my grandparent was my age: (19___)

What kinds of things did you throw away? _____

_____

What happened to your garbage THEN? Where did it go? _____

_____

What things did you NOT have then that you do now? _____

_____

What things are thrown away today that were not thrown away when you were my age? _____

_____

What things were recycled then? _____

_____

What things do you recycle now? _____

_____

EVALUATION: Using the timeline, describe the history of "garbage" and its future.

Decomposing: The Everlasting Cycle

OBJECTIVE:

The learner will describe the process of decomposition and will list the benefits of composting (saving landfill space and creating a useable product). They will compare a compost pile to a landfill, noting the differences in construction and degree of decomposition.

ACTIVITY IN BRIEF:

The learners will compare lego blocks to the elements of a decomposing log. A guided imagery will take them through the process of decomposition. Various materials will be composted with water and air as controls. Landfills and compost piles will be compared with emphasis on the inability of decomposition in the landfill.

MATERIALS:

Lego blocks, 2 buckets, leaves, vegetation, soil, grass clippings, clay

GRADE: K-6

SUBJECTS: language arts, science

TIM#: preliminary 45 minutes

GROUP SIZE: any size

SKILLS: application, description, listening, media construction, visualization

VOCABULARY: decomposition, composting, compost pile, bacteria, landfill, aerobic, anaerobic

CONCEPTS: Food waste and yard waste can be composted.

Decomposing: The Everlasting Cycle

PROCEDURE:

1. Make something out of lego blocks. Point out the different colors and sizes and shapes of the individual blocks making up the whole.
2. Take it apart and using the same blocks build a completely different object.
3. Ask: How many times can the blocks be reused and how many different objects can be made?

Tell the learners: "A tree is like a lego structure. It is made of many little parts (like individual lego blocks) and after it dies it is broken up into the original little parts, which can be reused and built into another structure (like a new tree)."

"You are going to imagine you are a tree. You will listen to a story about your life as a tree. You may lie down in a relaxed and comfortable position as you listen to the story. It will be easier to imagine yourself as a tree if you close your eyes and listen carefully to my words... Are you comfortable? Close your eyes and let's begin:

You are a tree. You are tall and stately. Your branches reach toward the sky. It's summer. You hold up your leaves which soak up the rays of the sun. It's warm and the breezes playfully tickle your leaves, making your branches sway gently. Birds flit about in your branches, and you grow. You become stronger. Feel summer! Gradually the days get shorter, the air becomes cooler and cooler. The summertime birds begin to leave. A leaf snaps off your branch. Then another... and another... until they are all piled around the base of your trunk. A cold gust of wind swoops them up into the air and they are flung all about you. Winter's first snowflake falls upon a branch. Winter is here. You feel the soft icy tingle of snow, gradually piling heavy on your limbs. It protects you from the harsh winter cold. It's so very quiet and you sleep... sleep... sleep...

Suddenly you are awakened to the sensation of the tingling of new growth in your limbs. You feel buds bulging with new life and they spring open with fresh young leaves pushing outward, straining to feel the sunshine and the crisp spring air. The frozen soil around your roots begin to thaw. Your roots can stretch again and can suck up nutrients from the soil. It flows through your body, making you grow, bigger and bigger. You are active and feel alive again!

You have been going through the summer-fall-winter-spring seasons for over 150 years. You are growing old and tired. Your roots weaken and are no longer able to hold you steady in the soil. The wind catches you, tugs at your branches. You are no longer able to stand up against the forces. Down you topple. A loud crash is heard in the forest. You come to rest on the forest floor.

Bushes, plants and grasses beneath you feel strange to your body where sky used to be. Insects crawl onto and under your bark. They nibble at you. Worms bore their way through your trunk, allowing more insects to gain entry to your inner core. Mosses and fungus cover you and you feel yourself dissolving. Rain soaks into you making you soft and soggy. Oxygen surrounds each pore and bit of you.

You find yourself coming apart - breaking and crumbling into smaller and smaller pieces. Bacteria are using the bits and pieces of what is left of your for their energy needs. The rain gently pushes you into the soil. You are no longer a tree. You are millions and millions of tiny parts sinking deeper and deeper into the earth.

Suddenly you feel your scattered pieces being pulled upward! Up! Up! Up you go and you feel yourself being sucked up through tine tubes of a new baby tree. You are becoming arranged into leaves, and trunk, and bark, and branches

on a brand new tree! And there are still pieces of your former self waiting in the soil, waiting to be put together, like lego blocks, into something new. You are always changing into new and different structures. You are hundreds of years old and are once again a fresh new life. You wonder what you may become next!

You may open your eyes, now, you are yourself again!"

Write the word "decomposition" on the board. Tell the learners, "Decomposition is when a tree or other plant is broken up into smaller and smaller pieces, much like taking apart a lego structure. When a tree breaks up into tiny pieces, it is decomposing. (Write this word on the board.) When a tree decomposes it turns into particles of soil which can be used by new trees."

QUESTIONS:

1. What other things besides trees decompose? Make a list of things at home which could decompose (lettuce, celery, grass clippings, etc.; anything that has ever grown and been alive).
2. What happens to these things when you "throw them away?" Where do they go? (landfill)

Tell them, "Food and yard waste eventually end up at the landfill. A landfill is tightly covered daily and consequently water and oxygen can't get in. (Write "water" and "oxygen" on the board.) When air and water can't get in, it takes a long time for the food and yard waste to decompose and turn into soil.

Let's do an experiment to demonstrate the effect of air and water upon decomposition.

Obtain two buckets.

In bucket #1 layer leaves, vegetable refuse, grass clippings and relatively fertile soil (not sterile soil), add moisture and mix and turn daily. This is labeled COMPOST PILE.

In bucket #2 layer the same proportion of leaves, vegetable refuse, and grass clippings, but leave out the soil, do not add water, do not mix, and cover with a layer of plastic or clay (ask the art teacher) to simulate the daily cover of compressed soil at the landfill. Label this THE LANDFILL.

Monitor the buckets. (Take their temperature, as this is a good indicator of the degree of decomposition taking place. The higher the temperature, the greater is the degree of decomposition.)

After three to four weeks, dump the contents onto old newspapers and have the learners examine them. The contents of Bucket #1 should have broken down into a dark chunky soil with little recognizable material remaining. You made useful compost out of garbage!

The contents of Bucket #2 should still look and smell like garbage.

The big question is, "Because there is not much oxygen and water under a covered landfill, can the things we throw away decompose?" Do things disappear in a landfill?

You can add air, water, and soil to your yard and food waste and get them to decompose. This is called composting and the pile of decomposing materials is a COMPOST PILE.

If you COMPOST at home, the landfill won't get filled up as fast and you can make beautiful rich soil out of all those things you were going to send to the landfill. Examine some composting guides on how to compost at home. The learners can each make a little booklet demonstrating how to set up a compost center.

Decomposing: The Everlasting Cycle

MY LITTLE BIT: With the help of my family, I will make a compost center at home so we can compost our kitchen scraps and yard waste. I can be in charge of stirring and watering the compost pile.

WE CAN MAKE A DIFFERENCE: We can write letters to lawn-mower sales representatives encouraging them to recommend mulching mowers instead of mowers with bag attachments, so that people won't have a lot of unnecessary grass clippings to deal with. We can make a poster to display at a lawn and garden center regarding composting yard wastes.

EXTENSION: Volume could be measured before and after composting at the school composting center. The composted soil could be used to grow plants to compare fertility with other soils.

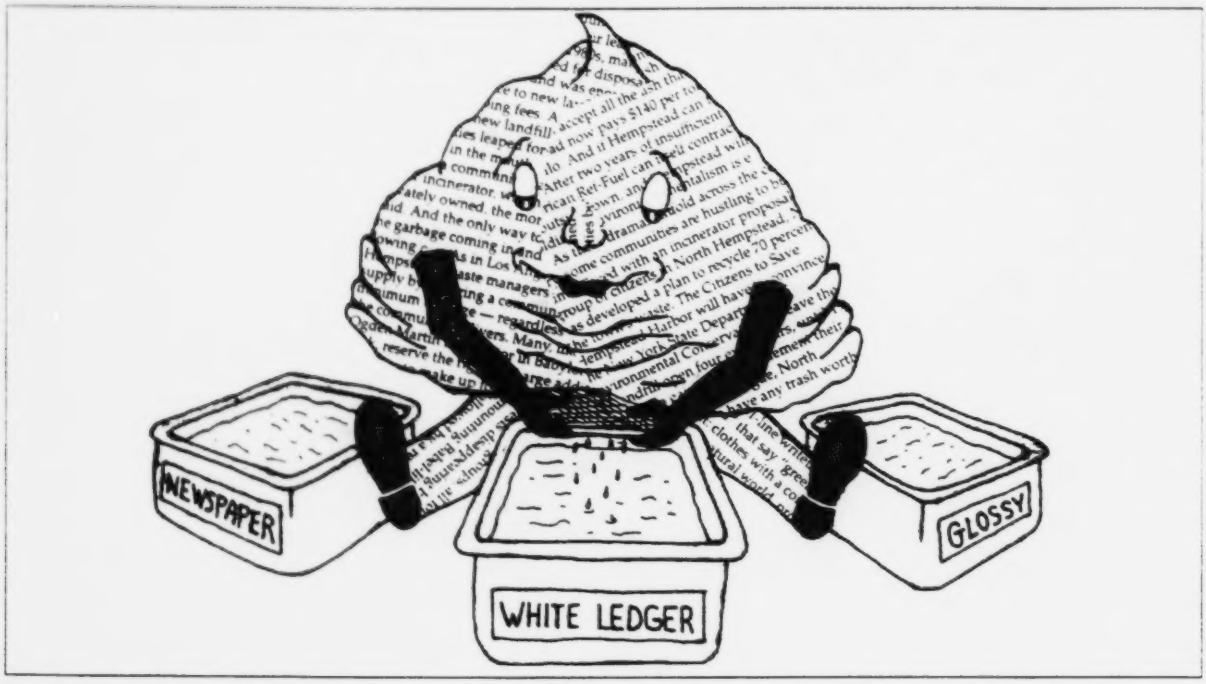
EVALUATION: The composting guide would be the evaluation tool. Learners will list the necessary conditions for decay, noting which ones are missing in the landfill (water and air).

BACKGROUND: For composting to work effectively, there need to be three ingredients of approximately equal proportions. These ingredients are (1) grass clippings and vegetable scraps, (2) soil, and (3) leaves or sawdust. Sufficient amounts of air and moisture are necessary. The bacteria present in the soil use the nitrogen in the green matter (leaves and vegetable scraps) to eat the waste material, reducing the components into rich soil. Air for the bacteria to breathe is introduced by periodically (once a day or week) mixing up the ingredients. Water for the bacteria to "drink" is added just enough to maintain a moist, not wet, environment.

Buckets should be kept outside unless severe freezing temperatures are likely.

The bucket simulating the landfill will not breathe (anaerobic) and, therefore, the speed of decomposition is severely retarded. The contents of the second bucket will smell badly and should be handled and disposed of carefully. Warmer temperatures will allow quicker decomposition.

From Trees to Paper. It's Slurry Time!



OBJECTIVE:

The learners will be able to describe the process of paper making and will be able to state the importance of recycling paper.

ACTIVITY IN BRIEF:

Learners will make paper by experimenting with different "recipes" resulting in different grades of paper. They will see the results of paper made out of contaminated slurry.

MATERIALS:

3 flat dishpans, blender, assorted papers, 6-6" x 6" screens trimmed with duct tape, bucket, box of newspapers, sponges (one for every 2-3 people), sheet

GRADE: K-6

SUBJECTS: art, science, language arts

TIME: 45-60 minutes

GROUP SIZE: 1-25 (unless additional adult help is available)

SKILLS: analysis, kinesthesis, concept development, application, classification, compariing similarities and differences, evaluation, public speaking, small group work

VOCABULARY: slurry, contaminants, ledger paper, conserve, recycle, "couch"

CONCEPTS: Paper can be recycled. Recycling may require a change in life style.

From Trees to Paper. It's Slurry Time!

PROCEDURE: Spill the contents of several days worth of wastepaper onto a sheet on the floor. (You may have to "plant" the necessary kinds of paper before the learners arrive.) Examine the various kinds of waste and classify the materials into paper and non-paper categories. Then separate paper by grade. (newspaper, white ledger, colored ledger, computer, tissue, magazine, and cardboard.) Ask the following questions:

1. What happens to our wastebasket trash after it leaves the room? (Does it end up in the landfill?)
2. How is paper made? From what is paper made? (trees...plant fiber)
3. What animal taught us how to make paper?

Show a paper wasp nest, if possible, and explain how the wasp chews up pieces of plants (fibers), mixes them with the starch in its mouth, then spits it out, presses it into "paper," and lets it dry. The wasp taught us how to make paper!

Recipe for Paper (from the kitchen of our friend the Wasp!)

1. Divide the learners into three paper making groups (the newspaper group, the white ledger group, the glossy magazine group).
2. Give each group their particular kind of paper to tear into little pieces (1-2 inch squares). Have each group fill a bowl with their particular kind of paper. (Soaking the paper in warm water overnight helps to soften the fibers, and the blender appreciates it, but it's not essential. It also makes it easier to tear into pieces.)
3. Blend each kind of slurry in a heavy duty blender using about a cup of paper to a blender full of water. NOW YOU HAVE SLURRY! The slurry should be smooth and pourable.
5. THIS NEXT PART IS A GOOD ONE TO DO OUTDOORS. Pour each prepared slurry into three flat dishpans. (Keep a reserve bucket of slurry nearby to replenish the supply in the dishpan.) Locate the screens next to each dishpan. (Screens are 6 x 5 inch squares of various gages of screen. The finer the gage, the finer the paper. The larger gage produces a more textured paper. Trim the edges of the screen with duct tape for safety.)

   Locate cups for pouring slurry onto the screens next to the dishpans.

   Locate a drying area nearby with a box of newspapers labeled DRY NEWSPAPERS, an empty box labeled WET USED NEWSPAPERS, and a container labeled SPONGES.

Directions for Making Paper:

Each learner will need a piece of used paper with his/her name on it. It can be folded up and kept in the pocket until needed.

1. Each learner in turn will pick up a screen, hold it over the dishpan, dip out a cupful of slurry, and pour it on the screen. (Or the screen can be dipped into the slurry and slowly lifted upward, catching a layer of slurry.)

2. Let the excess water drip through the screen (count to ten) and place the second screen on top and squeeze out even more water.

3. Now to the drying area! Take a dry newspaper, open it up, lay it on the ground, and lay the screens on one half. Fold the other half of the newspaper

over the top of the screen and stomp on it to squeeze out even more water. Move the screen to a dry spot and repeat several times. (Return all wet newspapers to the WET NEWSPAPER BOX.)

OR

Put the screens on the ground, and draw moisture through the screen using the sponge. (If you want the paper to be smooth on one side, remove the top screen and gently apply the sponge directly to the paper.) Squeeze out accumulated water and repeat. This process is called Couching, pronounced "kootching."

4. Pull the top screen away and flop out the recycled paper onto that piece of scrap paper being stashed away in the pocket. Take it to a designated drying area allowing 8-12 hours drying time. (The paper can be dried between toweling under a warm iron. Ask for parents or grandparents to bring their iron and help that day!)

YOU HAVE JUST CREATED A PIECE OF RECYCLED PAPER!

(Without having to chew a thing!)

The learners will repeat the process at each of the three slurry stations, carefully observing the differences in the three kinds of paper.

Save the remaining slurry and mix together. Ask the learners what might result if things like envelope windows, gum wrappers, aluminum foil, rubber bands, and other CONTAMINANTS become a part of the slurry. Tear these up into small pieces and add them to the remaining slurry. Make paper using this contaminated lot. Examine the finished product and evaluate its quality compared to paper made out of pre-sorted paper.

If we recycle our paper we will save trees, landfill space, and energy (because it takes less energy in the form of petroleum, natural gas and coal to make paper from used paper).

QUESTIONS:

1. Where and how should we set up our paper recycling center?
2. Why is it important and how should we keep contaminants out of the paper we want to recycle?
3. How can we conserve paper? (How can we reduce our usage of paper?) Make a list and display it as a reminder.

MY LITTLE BIT: I will conserve paper whenever possible! I will consult the list often, and I will encourage my family to set up a collection system at home. If my school or meeting place has a paper-to-be-recycled box, I will keep it free of contaminants.

WE CAN MAKE A DIFFERENCE: We will hold an all-school assembly to encourage the audience to conserve paper and establish a recycling program if there is not one already in place. We will explain why paper needs to be sorted correctly and carefully and show the examples of contaminated and "clean" paper.

EXTENSION: Adopt a tree nearby and expound upon it's attributes, including its "giving" of oxygen, shade, habitat for wildlife, lumber, for paper, fruit and nuts.

Invite the local newspaper to take pictures and feature a story regarding the recycling project. Ask for community support for the project and encourage others to take action for (1) conservation of paper and (2) recycling of recyclable paper.

Videotape the paper-making process and let the

learners prepare a script for other classes demonstrating the paper recycling process, explaining the necessary steps. The script would also emphasize the need to separate paper qualities and colors and to keep out contaminates.

Make a class book using the recycled paper for the pages.

EVALUATION: On their own piece of recycled paper, each learner will write a poem or statement concerning the importance of recycling paper.

BACKGROUND: Paper mills buying collected paper have certain standards which must be met to produce specific grades (qualities) of recycled paper. In order to meet these standards they will reject or downgrade loads of incorrectly sorted (contaminated) paper.

One must learn to sort according to area recycling center standards. Standards will vary according to the outlet purchasing the paper.

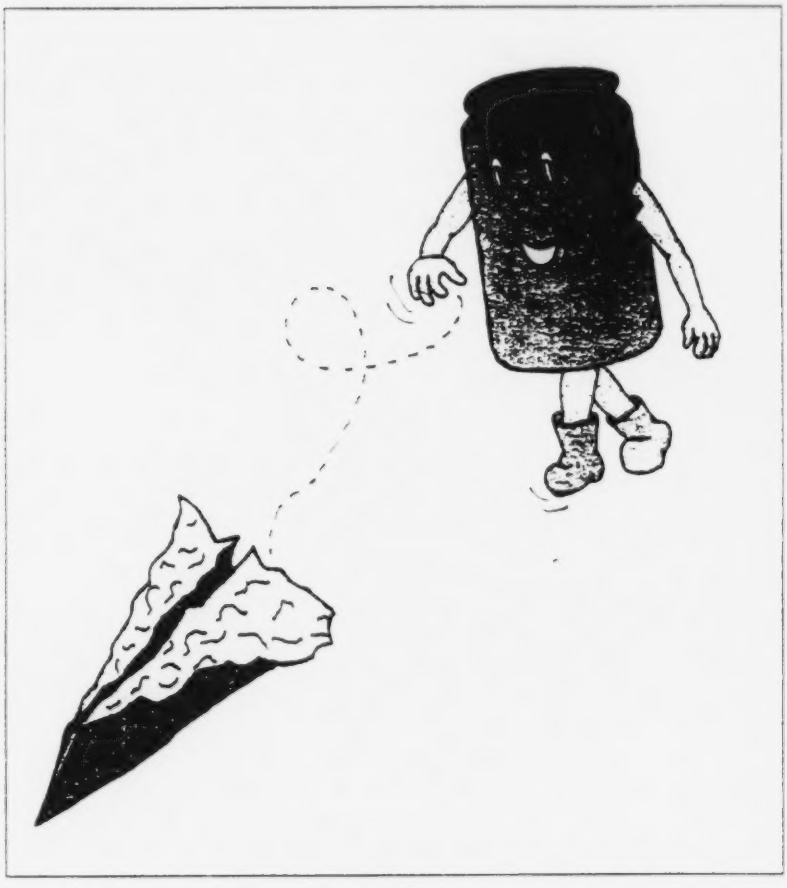
Foiled Again!

OBJECTIVE:

The learners will predict the number of times an aluminum can could be recycled. They will distinguish the difference between aluminum, steel and tin.

ACTIVITY IN BRIEF:

Each learner will create an aluminum foil container to fill with popcorn, raisins, or some other healthy snack. After it is used it will be thrown into the aluminum recycling box. Each learner will then extract a used container from the box to recycle into a new useful product. This process will be compared to the process of recycling aluminum and bimetal (tin and steel) cans. A can and aluminum recycling center at school and at home will be organized.



MATERIALS:

healthy snacks, bowl of sudsy water, sponge, towel, trash can, rolling pin, juice, aluminum foil, string, tape, etc., various examples of cans

GRADE: K-6

SUBJECTS: math, social science, art

TIME: 60 minutes

GROUP SIZE: any size

SKILLS: discussion, invention classification, writing, computation, application, evaluation, kinesthesis, concept development

VOCABULARY: bimetal, tin can, aluminum can, consumer, recycler, manufacturer, bauxite

CONCEPTS: Aluminum can be recycled. Recycling may require a change in lifestyle.

Foiled Again!

PROCEDURE: Each learner will receive a twelve inch square of aluminum foil to form into a container for a healthy snack (raisins, popcorn, fruit, etc.). Display the many kinds of containers. Let each learner choose one and as the learners are enjoying their snacks, talk about the kinds of containers made from aluminum, tin or steel. Show some examples.

All of the empty containers will be tossed into a box marked "Recycle Aluminum Here." Each learner then will extract a container from the recycle box, flatten it, wash and rinse it, and reshape the aluminum into a cup to hold a beverage (water or juice).

Ask the learners how many times their aluminum could be recycled. Help them compare this activity to the real process of recycling aluminum. (See background.)

Write this fact on the chalkboard: "The entire U.S. Navy fleet could be built with the aluminum that is thrown away by U.S. citizens each year." Let the learners build an aluminum foil airplane from their piece of foil, either individually or united. After they have been properly test-piloted, make a class mobile using their planes and some high flying facts about aluminum and other recyclable metals. (See background.)

Show the learners how to tell the difference between aluminum and bimetal cans. (The typical food can is 99% steel and 1% tin. This type of can will be attracted by a magnet and will have a seam. Aluminum cans will not have a seam and will not be attracted to a magnet. Let the learners experiment and separate the cans into categories.) Tell the learners that the raw material for aluminum is bauxite, and tin and/or iron is the raw material for "tin" cans. Locate on a world map where bauxite, tin, and iron are found. (See appendix for countries and their resources.)

Set up a display of recyclable metal containers. Display this at a grocery store to educate and inform people about recycling.

How is aluminum foil made? Write to Alcoa. How are cans made? Research and write to companies inquiring how their containers are made and if recycled materials are used. (See background.)

MY LITTLE BIT: I can volunteer to rinse cans at home, remove the ends, flatten them and help deliver them to the recycler. (PRODUCT WARNING! CHILDREN MUST BE SHOWN HOW TO SAFELY DO THIS!)

WE CAN MAKE A DIFFERENCE: We can chart a running count of the number of cans recycled by our united effort and send it to a local news station or newspaper. We can challenge ourselves and others to gain percentage in the number of cans recycled.

We could design a poster promoting the importance of recycling cans, and we would receive permission to display it at the grocery store.

We could send a portion of the money received by cashing in soda cans to an organization which is dedicated to helping the environment.

EXTENSIONS: Research aluminum production. Make a model or picture of a steel or aluminum plant. Write to Alcoa for information and/or pictures:

ALCOA
P.O. Box 3567
Davenport, IA 52808

Find out where the raw material for aluminum (bauxite) is located in the world and how much of this resource is left. (See appendix background.)

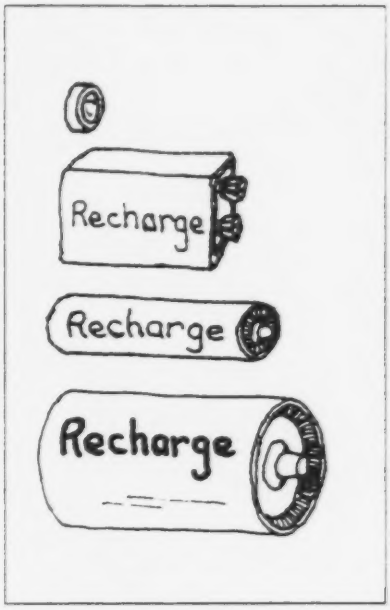
EVALUATION: Distinguish an aluminum can from a bimetal (tin) can. Report the number of cans prepared at home for recycling.

Battling Batteries

OBJECTIVE:

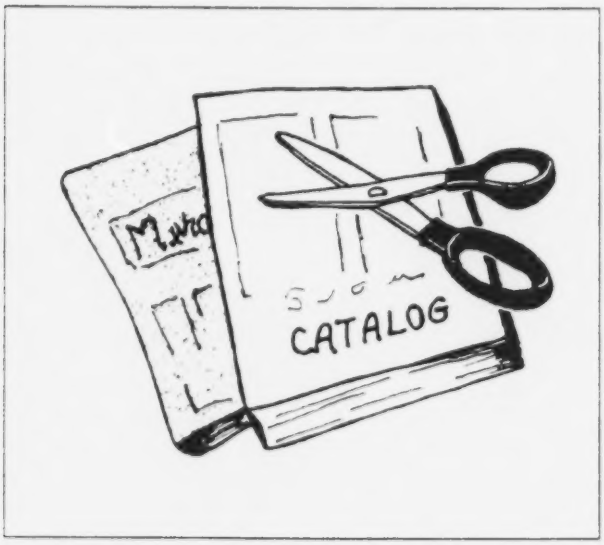
The learners will identify some of the many uses for batteries, and they will describe the various ways of dealing with used batteries with respect to the environment.

Other toxic wastes will be identified and their proper means of disposal will be demonstrated.



ACTIVITY IN BRIEF:

The learners will play charades by acting out battery powered objects. They will pretend they are a battery, and when they "run down" they will either get recharged or be thrown into the landfill. They will discuss the hazards to groundwater of toxic wastes in a leaky landfill. A booklet will be made about safe alternatives to hazardous household chemicals.



MATERIALS:

magazines, examples of hazardous household products, nutritious treats

GRADE: 3-6

SUBJECTS: physical education, science, art

TIME: 45-60 minutes

GROUP SIZE: any size (2 teams)

SKILLS: kinesthesis, concept development, research, application, classification, media construction, discussion, evaluation, writing

VOCABULARY: recharge, leachate, contamination, toxic (toxins) groundwater, hazardous, alternatives, battery chemicals, landfill, alkaline, zinc

CONCEPTS: Hazardous wastes require special procesing for safe disposal. Each citizen can reduce the volume of waste she/he produces.

Battling Batteries

PROCEDURE: Cut out pictures from magazines or catalogs of items "run" by batteries. Glue these onto index cards. (Either let the learners do this or have them prepared ahead of time.)

Divide the learners into two teams. (Duracells vs. Energizers?) Each team will have a "contact point" who will be the spokesperson for the team.

Begin by telling them that they will take turns acting out items which are run by batteries. One person from the first team will draw a card and act out the item on the card for the oppostie team to guess. The guessing team will discuss among themselves what they think the item is. The team's "contact point" will give the answer. (This eliminates the whole team blurting out many answers.) If they are correct, they score a point. If not, the other team can receive the point if their "contact point" gives the correct answer.

The game continues with teams taking turns and accumulating points. (Predetermine a time or point limit.)

Now tell them that they are to imagine themselves as batteries. They will "run" (jog in place) until they feel run down. Half of the learners will be designated as rechargeable batteries. Four areas of the room will be designated:

1. the landfill
2. the recharge center
3. the battery in use center
4. the battery at rest center

Batteries have varying lengths of "life." The learners will become batteries "in use" when they expend quiet energy marching or jogging in place (to music?) at the battery "in use" center. After a few minutes, the batteries will begin to weaken. The rechargeables will go to the battery-at-rest center where they too will sit quietly for the following discussion:

Rechargeable batteries may be recharged by going to the charge center (where drink and/or refreshment will be provided) or they may choose to go to the in-rest center with the non-rechargeable batteries to rest for one minute. (Rugs or mats may be available. After one minute all batteries will return to the "in use center" where they will once again expend their energy. In a few minutes, the non-rechargeable batteries will go to the at-rest center and the re-chargeable batteries will go to the at-rest center and the re-chargeable batteries can choose to be recharged or rested. Again, after a minute all batteries will return to the in-use center for more energy use. This process will continue until the non-rechargeable batteries are finally "run

down" and so must go to the landfill where they will lie down and remain for hundreds of years. Rechargeable batteries will go to the battery at rest center where they will sit quietly for the following discussion:

1. How did you feel after several minutes of being used?
2. How did you feel after you had a rest or refreshment?
3. How did you feel as a non-rechargeable battery? When you were told you had to remain in the landfill for hundreds of years?
4. What do YOU do with run down batteries? (Do you toss them away so they end up in a landfill, or do you recharge them?)
5. Can all batteries be recharged? (Only designated rechargeable batteries can be recharged.)
6. What happens to batteries left in a landfill? Will the chemicals harm the environment? (Most alkaline batteries contain mercury and cadmium, highly toxic substances.)

   Tell the learners that landfills must be carefully prepared so that harmful substances such as battery chemicals cannot seep down into the groundwater underneath the landfill. (They must be lined with clay and plastic.)
7. What could you do to prevent battery chemicals from leaking into the water under the landfill? (Buy rechargeable or non-toxic batteries, and dispose of batteries on toxic waste clean-up days. Use electricity whenever possible instead of using batteries.)
8. What are some other household materials which could pollute the groundwater if they end up in a leaky landfill? (Distribute copies of the household hazardous materials guide. See background.)

Make a list or create a display of hazardous materials using empty, clean containers of household chemicals.

Discuss each item and the means of disposal and alternate safe substitutes for each.

Discuss the pictures of products used in the relay race. Consensus by the group is nice but not required.

1. What products do we need to use to help us stay alive (absolutely critical to life)?
2. What products do we **need** to make our world safer or cleaner?
3. What products do we use to make our lives easier, to save time, provide power to do a difficult job?
4. What products do we use for play or recreation?
5. What products could be operated with a power source other than batteries which get "thrown away" when they are spent (i.e. solar powered calculators, power cords used instead of batteries)
6. Ask the learners to think about this question without answering out loud "What products do you feel are so important you will continue to use them with batteries which you may have to store for a long time because you can't put them in the garbage?"

Together, come up with ways to tell as many people as possible about the importance of not throwing batteries in the garbage. Can you find another club or class to tell? Could younger learners write notes of their own to bring home? Could older learners make up a song or a rap to send to the local media?

Make a pledge to find at least three different people to tell about the importance of not throwing batteries and other hazardous materials in the garbage.

MY LITTLE BIT: I will talk to my family about purchasing non-toxic batteries. (The "Volta" battery contains zinc which is relatively non-toxic.) I can use the cord to the boom box whenever possible so I don't use as many batteries.

Battling Batteries

I can fill a pump sprayer type bottle with a solution of three parts water and one part vinegar. I can wash the mirror in the bathroom or the windows in my house by using this safe product and an old newspaper.

WE CAN MAKE A DIFFERENCE: We can create a booklet of examples of safe household products. After the booklet is completed, we will each have a turn taking it home and sharing it with our families. (Divide the learners into small groups of 3 or 4. Give each group the name of a hazardous household product for which there is a safe substitute. They will create a page with text and pictures.)

EXTENSION: The learners will make a traveling display of common household hazardous wastes and safe substitutes by using empty containers, photographs, advertisement, etc.. They could present their information to other classes, service clubs, and other organizations or businesses. Maybe a local business will agree to display this information.

EVALUATION: The learners will tell why it is important to prevent hazardous waste from entering the landfill. They will name three common household products which are hazardous and will offer appropriate safe substitutes for these.

BACKGROUND: Rechargeable batteries should be used when possible and specific batteries, such as hearing aid or watch batteries , should be taken back to the store where they were purchased so they can be properly disposed. Car batteries can be recharged, and the retailer of car batteries must take back and properly dispose of unusable car batteries. Invite someone from the Department of Natural Resources (D.N.R.) or the Solid Waste Commission to speak on these specific issues.

Batteries are just one of many potential sources of hazardous materials which may get accidentally put in a landfill. Any hazardous materials in a landfill could get into the groundwater in various ways. All across the United States there are locations where hazardous materials have leaked from landfills and contaminated water supplies.

Batteries are a common product which many people don't realize should not be put in a landfill. Unfortunately, battery recycling is not widely developed, either as a technology nor as part of a recycling collection program. When batteries are recycled, most commonly the metals are what is reclaimed. Different kinds of batteries have different metals in them such as lead, mercury, silver, nickel, or cadmium.

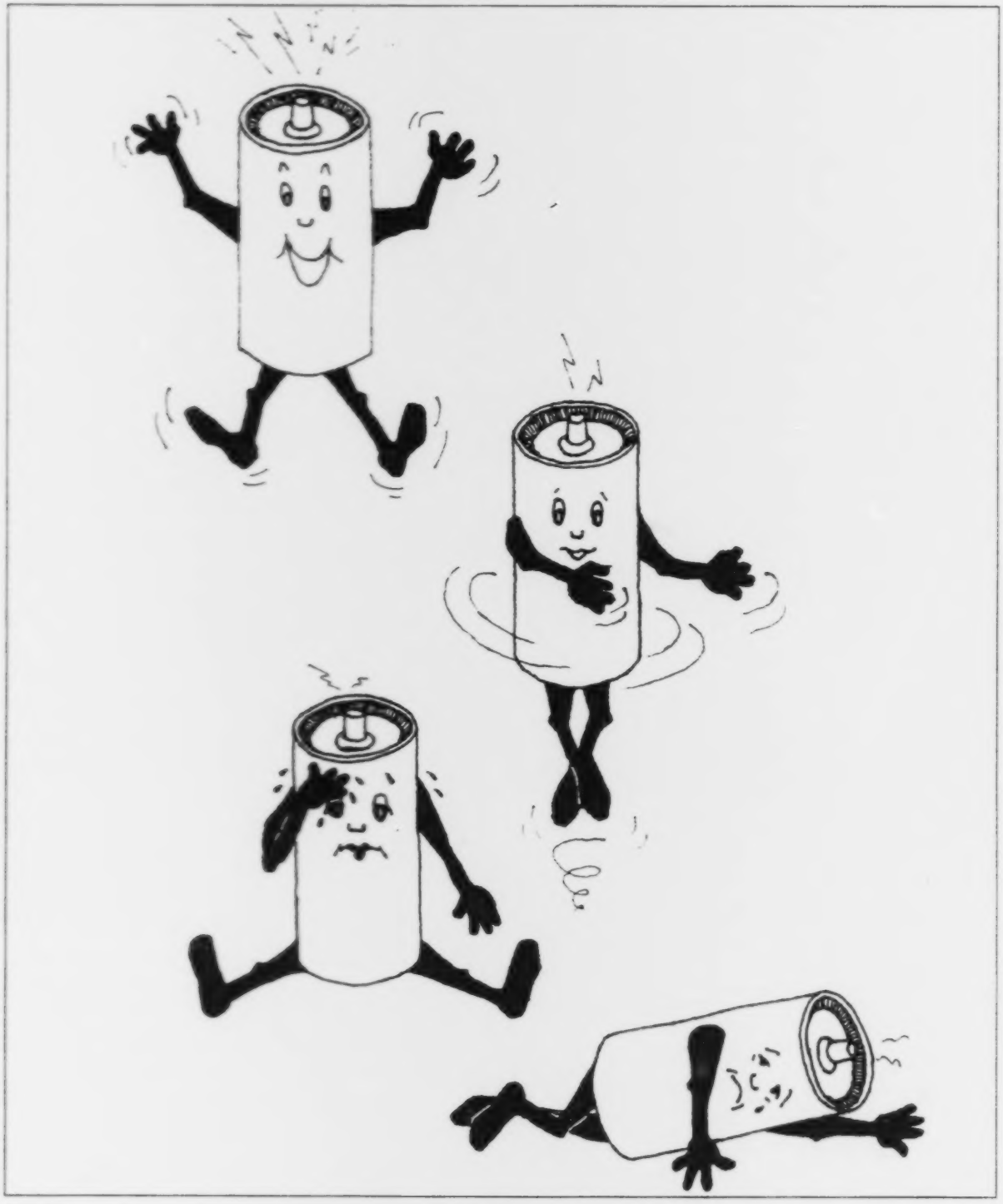
In 1990, only one company in the eastern United States recycled the common household "C-" or "C-" cell type of battery. Any collection program receiving batteries and accumulating a large quantity of them would run the risk of becoming a hazardous waste site if batteries were broken and leaked.

Car and truck batteries are heavy to handle and can be messy with leaking acids and corrosion. However, in Iowa, there is a system for getting rid of them through some metal scrap dealers. Any retail outlet which sells batteries must take back spent batteries. A few recycling collection programs will take batteries, also. Sometimes a small amount of money is paid for the returned batteries.

The easiest batteries to recycle are the small button batteries used in cameras, watches, hearing aids and calculators. Most jewelers in Iowa have access to dealers who will buy the spent batteries from them. Even though these batteries are very small, they must not be put in the landfill. It would be possible for a battery to be crushed in the collection or compaction process. The mercury in a hearing aid battery could contaminate six tons of refuse.

Battling Batteries

Rechargable household batteries are becoming more available as consumers are choosing to fight hazardous waste and protect their drinking water supplies.



Battling Batteries

Household Products

PRODUCT	DISPOSAL SUGGESTION	SUBSTITUTES
Alcohol-based lotions (aftershaves, etc.)	D	None
Ammonia-based cleaners	D-E	Baking soda; vinegar and salt
Bathroom cleaners	D	Baking soda; vinegar and salt
Bleach (cholorine)	D-E	Borax; non-chlorine bleach; lemon juice
Disinfectants	D-F	Isopropyl alcohol; borax, detergent cleaners
Drain cleaners	D-F	Plunger; plumber's snake; boiling water/salt; wash soda
Floor care products	B	Numerous substitutes (Contact Metro Solid Waste)
Furniture polish	B	Olive oil and vinegar; olive oil and lemon juice
Hair relaxers	D	Unknown
Hair removers	D	Shaving
Insect and pest sprays	B	Lures and traps; natural predators
Medications (expired)	D-F	None
Metal polish (with petroleum distillates)	B	Numerous substitutes (Contact Metro Solid Waste)
Nail polish (solidified)	A	None
Nail polish remover (evaporated)	A	None
Oven cleaner (with sodium hydroxide)	D - F	Salt; vinegar; baking soda
Spot remover; dry cleaning solvents	B	Club soda
Toilet bowel cleaner	D - F	Baking soda and vinegar
Tub and tile cleaners	D	Baking soda and vinegar
Window cleaners	D	Water or vinegar; wipe with newspaper or linen towel

DISPOSAL KEY

A. Can be safely disposed of in a landfill.
B. Save for next household hazardous materials collection day.
C. Recycle or save for next household hazardous materials collection day.
D. Use completely, recycle, or pour down the drain with plenty of water.
E. Never mix ammonia products with chlorine bleach; a poisonous gas is produced.
F. These products should never be sent to a septic tank.
G. Some gas stations and auto supply stores will accept these products if they are in properly labeled containers.
H. DO NOT use up wood preservatives containing creosote, pentachlorophenol, or arsenic. Wood which has been treated with these products is also hazardous and should not be burned.
I. DO NOT use up products labeled "Restricted Use". Deliver these products to your next household hazardous materials collection day.
J. Deliver to a fire station, police station, or sheriff's office.
K. Some substances are not suitable for disposal. Please contact Metro Solid Waste personnel.

Petroleum to Plastic... to Plastic... to Plastic...

OBJECTIVE:

The learners will examine various kinds of plastics and will identify which ones can be recycled in the area. They will analyze the various qualities of plastics and will be able to describe the "recipe" procedure used in plastic production.

ACTIVITY IN BRIEF:

The learners will look for the code located on the underside of various plastic containers. They will determine ways to categorize the different grades. A gelatin cube demonstration will demonstrate the "recipe" procedure of plastic production.

MATERIALS:

Knox gelatin cubes (See recipe), Assorted materials for molds, Microwave (or a hot plate), A glass pan for each group, Examples of plastic

GRADE: 3-6

SUBJECTS: science, language arts, math, social science

TIME: 50-60 minutes, allowing time for gelatin to set

GROUP SiZE: works best with 15 or more

SKILLS:: classification, comparing, description, observation, small group work, problem solving, synthesis

VOCABULARY: plastic, polyvinyl chloride, polythylene taraphthalate, polystyrene, contaminates

CONCEPTS: Most materials can be recycled and some can be collected and processed in ways which reduce their volume or divert them from the waste stream. Plastic is one of them. However it may be necessary to separate some forms of plastic.

Petroleum to Plastic... to Plastic... to Plastic...

PROCEDURE: Either provide or have the learners bring from home two or three different plastic containers. Put them all out on the floor in a pile and let the learners examine them and then devise a system for sorting them.
On an overhead, show the seven main symbols used to identify plastic according to their resin types. Now let the learners find these symbols and re-sort the plastic using this system. (See handout.)

QUESTIONS:

1. Where does plastic come from? What is the main ingredient? (PETROLEUM! A NONrenewable and decreasing resource. NOTE: Most experts concur, "Petroleum will be extremely expensive due to its scarcity within sixty years.")
2. If the world were to run out of petroleum, what material could replace it? (Glass, Aluminum, Tin?)
3. What special qualities does plastic have that glass, aluminum, or tin doesn't? (It's unbreakable, clear, lightweight, etc.)

HOW IS PLASTIC MADE? Do some research or invite a speaker to come and talk about plastic production. OR, do the following activity to help them visualize the process.

Tell them: "Plastic and gelatin are somewhat alike in the way they are made. Both plastic and gelatin cubes can be melted down and remolded. Because it is dangerous to breathe the fumes of melting plastic, let's look at how gelatin is made."

1. Make three colors of finger gelatin using the recipe for Knox gelatin. (See background.) It won't be tempting to eat or as messy as sugared gelatin would be.
2. Separate the three different colors and either microwave the cubes (it only takes a few seconds) or melt them on a hot plate. Be sure to set aside a few cubes of each color for later.
3. Pour the warm liquid into a "mold" (an ice cube tray or a small pan).
4. Put the molds in a cool place to firm up.

QUESTIONS:

1. How many times can this process be repeated? How many times can plastic be recycled?
2. What if a cube of a different color got melted with another color? Will it change the outcome of the batch?

Let's try it and find out:
Melt one or two red cubes in with a batch (10 or so) of clear cubes. What is the resulting color?

Try other combinations. (Or let small groups of learners choose 15 cubes to experiment with.)

After sharing their discoveries, talk about the problems plastic recyclers would have if they incorrectly mixed the colors and got a color different than the one requested by the buyer. (For instance, what if the buyer ordered clear plastic milk jug containers and found some of them pink?!) Sometimes this happens and a maverick color gets into the "broth" and contaminates the recipe.

NOW find out what kind of plastics are being accepted by the nearest recycler in the area. How does the plastic need to be prepared for the local collector? (Do they need to be separated by color, code, etc.?)

Write or call a plastic manufacturing company which uses plastic to be recycled (like Hammer Plastics in Iowa Falls) to find out more about the process and what products can be made out of used plastic. (NOTE: "Recipes" are guarded

secrets and probably will not be given out by the plastic recyclers!)

THINK ABOUT THIS: If plastic were not recycled and if it were thrown into the landfill, what would happen to our landfills and what would happen to the finite reserves of petroleum?

MY LITTLE BIT: Before purchasing a product in a plastic container, I will look for the code on the bottom to see if it can be recycled in my area. I will also consider whether there is a better method of packaging for the product I wish to buy. (i.e., Does it come packaged in a material that is renewable such as paper, or better yet, can I buy it without any packaging?

WE CAN MAKE A DIFFERENCE: We will make available a shopper's guide to help shoppers make environmentally wise choices at the grocery store. It will list the codes to look for and will recommend items which come in environmentally sound packaging. (i.e., If there is a choice between a code 7 plastic or a glass containers, it would be better to purchase the glass. (See EXTENSION.) If milk jugs can be recycled in my area, it would be better to buy the milk in jugs and recycle them than to buy the milk in cardboard cartons which can't be recycled and will end up in the landfill.)

EXTENSION: Make a display of plastic containers which can be recycled. Invite parents in to see the display. Have the learners give a presentation on recycling to parents, other classes, etc..

Write to companies which use or make plastic packaging which is harder to recycle. Tell them your concerns about using a nonrenewable resource for short-term purposes.

Activity Idea: FOUR LAYER GELATIN
Make a pan of gelatin with 4 different colored layers (as you would do a four layer gelatin dessert, letting each layer firm up before pouring on the next layer). Talk about the code 7 plastic which is actually made up of several kinds and layers of plastic. It cannot easily be recycled because it is not "pure". Show what happens when it is melted down and remolded.

EVALUATION: List the code numbers of plastics which can be recycled in the area. State why it is important to purchase recyclable plastic.

BACKGROUND:

Recipe for Knox Blox:
8 envelopes of Knox unflavored gelatin
2 cups cold water
6 cups boiling water

Sprinkle gelatin over cold water and let it stand for a minute. Add boiling water and stir until gelatin is completely dissolved. Divide into four parts. Leave one part clear. Add food coloring to each of the remaining parts to make three different colors.

Pour the liquid into ice cube trays, keeping the colors separate.
Chill until firm. (Or pour the liquid into pans and cut into cubes after it has firmed.)

Petroleum to Plastic... to Plastic... to Plastic...

Society of the Plastics Industry
1275 K Street, N.W.—Suite 400
Washington, D.C. 20005
(212) 371-5200

PLASTIC CONTAINER CODE SYSTEM

To: Collectors of Plastic Bottles for Recycling

To assist in separating plastic bottles by resin type, thereby creating a higher value recycled material, a nationally recognized system has been established to mark bottles, jars, and other rigid containers by the six most widely used resin materials. Beginning July 1, 1988 the molded marks below will be applied by producers to some plastic bottles. Full use will be gradually introduced over three years, with most bottles coded by mid-1991. Here is what to look for (guidelines for code use):

PLASTIC BOTTLES 16 OZ. CAPACITY AND LARGER
(Other rigid plastic containers, such as tubs and trays, 8 oz. and up)

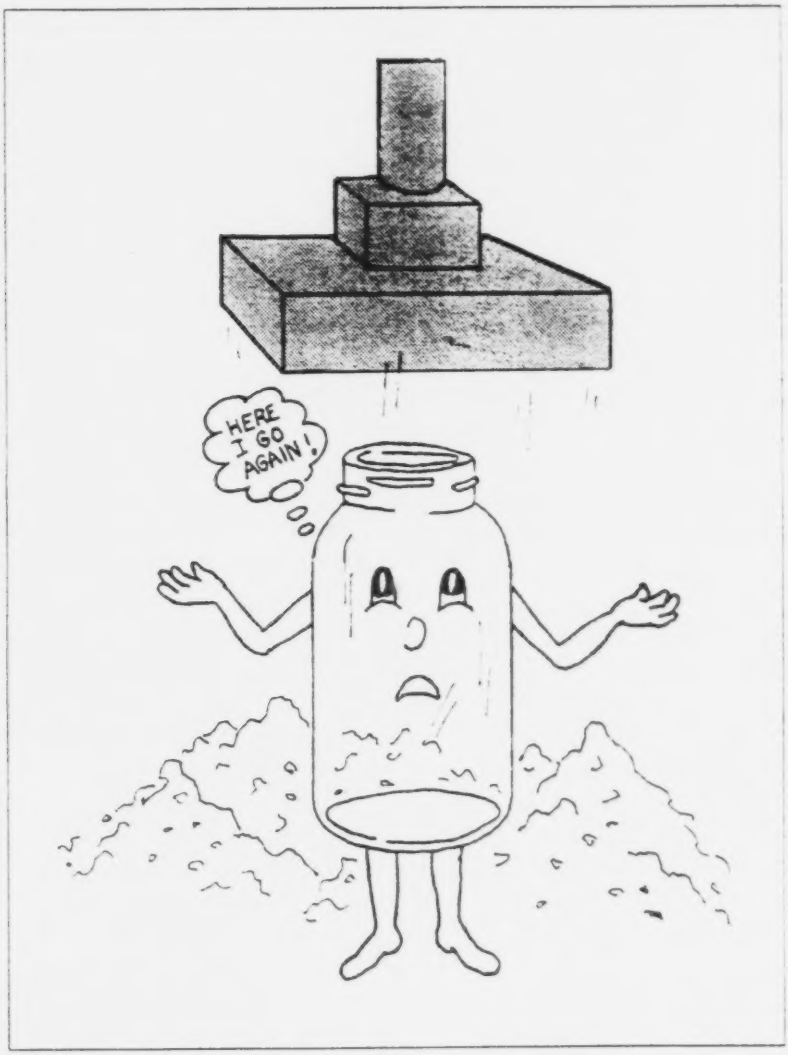
LOCATE CODE ON BOTTOM OF BOTTLE OR CONTAINER
(Or as near as possible with special shapes)

SIZE OF SYMBOL: MINIMUM 1/2 IN. - MAXIMUM 1 IN

CODE	MATERIAL	% OF TOTAL BOTTLES
1 PETE	Poly-Ethylene Terephthalate (PET)*	20-30%
2 HDPE	High Density Polyethylene	50-60%
3 V	Vinyl / Polyvinyl Chloride (PVC)*	5-10%
4 LDPE	Low Density Polyethylene	5-10%
5 PP	Polypropylene	5-10%
6 PS	Polystyrene	5-10%
7 OTHER	All Other Resins and Layered Multi-Material	5-10%

*Stand alone bottle code is different from standard industry identification to avoid confusion with registered trademarks.

Glass In A Flash!



OBJECTIVE:

The learner will describe the steps involved in recycling glass and will compare the benefits of recycling glass to making glass "from scratch."

ACTIVITY IN BRIEF:

The students will simulate the process of recycling glass through interpretive movement.

MATERIALS:

labels for each learner, glass recycling bin/box

GRADE: K-6

SUBJECTS: physical education, social science, science, language arts

TIME: 30 minutes

GROUP SIZE: 5 or more per group

SKILLS: synthesis, kinesthesis, concept development, classification, application, discussion, listing, media construction

VOCABULARY: cullet, manufacturer, factory, metal, soda lime, silica, kiln, contaminants, BTU

CONCEPTS: Most materials (i.e., glass) can be recycled. Recycling may require a change in lifestyle.

Glass In A Flash!

PROCEDURE: Each learner will become a piece of glass ready to be recycled. Before you begin, distribute a color designation label to each learner to wear so the learners can be equally divided into three groups according to color. (Cut the labels into small irregular cullet sized shapes. Leave one third of them clear, color one third of them brown, and color one third of them green.)

1. The first step in recycling glass is to sort the various pieces of glass into the three respective colors. The students will group themselves according to the color they are wearing on their color labels. (One wrongly sorted piece of glass can "contaminate" the entire shipment and the manufacturer might refuse that batch.)
2. Next the glass must be crushed in a special glass crusher. (Direct students to jump up and down until all their sharp edges are gone and they become CULLET, uniformly sized and smooth edged.)
3. Because there is no glass manufacturer in Iowa, they (the cullet) are put into a barrel and transported out of the state. (The learners clump together by color and jiggle as if on a truck or train car.)
4. Finally they reach the factory, where they will sit on the floor, still grouped by color. The cullet is then run through a magnetic device to remove metals, such as rings from bottles. (Learners do sit-ups.)
5. Next plastic coatings and paper labels must be removed with a huge vacuum. (Learners do leg lifts.)

Now it is ready for use!

The manufacturer (appoint one person from each group) will mix the cullet with soda lime, and silica by weaving in and out of the bodies and rubbing imaginary ingredients on each shoulder. The temperature rises to 2,500 degrees F. (learners fan themselves) and the cullet particles melt together. (Everybody joins hands.) As the glass begins to cool, it is lifted from the kiln, and is molded into many different shapes. The manufacturer takes a hand, lifts the line to their feet, and weaves the learners in and out, over and under each other, tying the learners in a glass product (a beautiful jar, a vase, a bottle, etc.) Upon completion, the learners will raise their arms, step toward the center and shout, "yea!" The glass will break if anyone lets go of a hand, and that section, all the way to the end, would have to start all over again as cullet and go through the entire process from the beginning. Have the steps posted where they can be easily seen by the learners.

Inform learners, "Glass is a wonderful thing because it can be recycled over and over again." The used or broken glass container is taken to the recycling center by car to be recycled again. The learners walk to a new location, still holding hands. The old manufacturer now joins hands with the end person and the head of the line becomes the new manufacturer. The new manufacturer will now direct the process again following the directions on the chart, which is visible for all to see:

1. Glass is crushed into cullet. (Jump up and down.)
2. Cullet is transported to market. (Jiggle on the truck or train.)
3. Metals are removed. (Do push-ups.)
4. Labels and coatings are removed. (Do leg-lifts.)
5. Cullet is mixed and heated. (Ingredients are rubbed on shoulders.)
6. Molten "glass" is formed into an object.

If the chain breaks, participants must go through the complete process again. This process can repeat itself indefinitely because glass is 100%

recyclable! Challenge them to go through the process as many times as they can within a designated allowance of time. Tally the number of times each group recycled, and total the number for the whole group. Call "time" and tell them that this time, the person who owned them did not recycle them and instead threw them into the landfill where they will lie for thousands of years. They will all go to the designated landfill area and lie quietly. Encourage them to think about being a piece of glass at the landfill.

QUESTIONS:

1. How many times was the glass in your group recycled?
2. How many times can glass be recycled?
3. What do most people do with glass once it is used? (Nationally, 80% of container glass winds up in the landfill, and because glass takes so long to decompose it will lie there for thousands and thousands of years.)
4. What products might be made from recycled glass? (Make a list.)
5. Make a list of energy and resources needed to produce glass "from scratch". Don't forget fuel and transportation costs! (Glass produced from recycled glass instead of raw material reduces related air pollution by 20% and water pollution by 50% and uses up to 32% less energy.)
6. What can YOU do to help save natural resources, landfill space and lots of energy? (REDUCE! REUSE! RECYCLE!) Make a list!

MY LITTLE BIT: I will make a bottle or jar-shaped booklet showing the steps necessary to start the glass recycling process at home.

<u>HOW TO START A GLASS RECYCLING HABIT AT HOME</u>

1. Set a bin (a sturdy cardboard box) in a handy location (garage or kitchen)
2. Rinse glass free of food contaminants.
3. Remove any metal collars, corks, or metal caps which can't be removed magnetically. Find out if labels need to be removed for the recycler in your area.
4. Check with your local recycling center to see if it is necessary to sort glass according to color (clear, brown, and green).
5. Help deliver the glass to the recycler.

WE CAN MAKE A DIFFERENCE: We will present our glass recycling "skit" to other classes and will encourage them to recycle glass in their homes.

EVALUATION: Name two reasons why it is important to recycle glass. (It conserves resources, energy, and landfill space.)

List the steps necessary to recycle glass starting with a broken used piece of glass and ending with a new recycled bottle. (A picture or diagram can be drawn as an alternative, if so desired.)

BACKGROUND: In Iowa, 95% of all soda pop containers are returned for deposit and recycled. The average glass soda pop container is REUSED approximately 15 times before it is recycled! This is a tremendous saving of energy.

It takes about 7,600 BTU's of energy to produce a single pound of glass. Cullet actually melts earlier than the individual new ingredients and so the addition of cullet lowers the melting temperature of the mixture. This speeds up the process and thus requires up to 32% less energy. Cullet makes up approximately 25% of every batch of container glass.

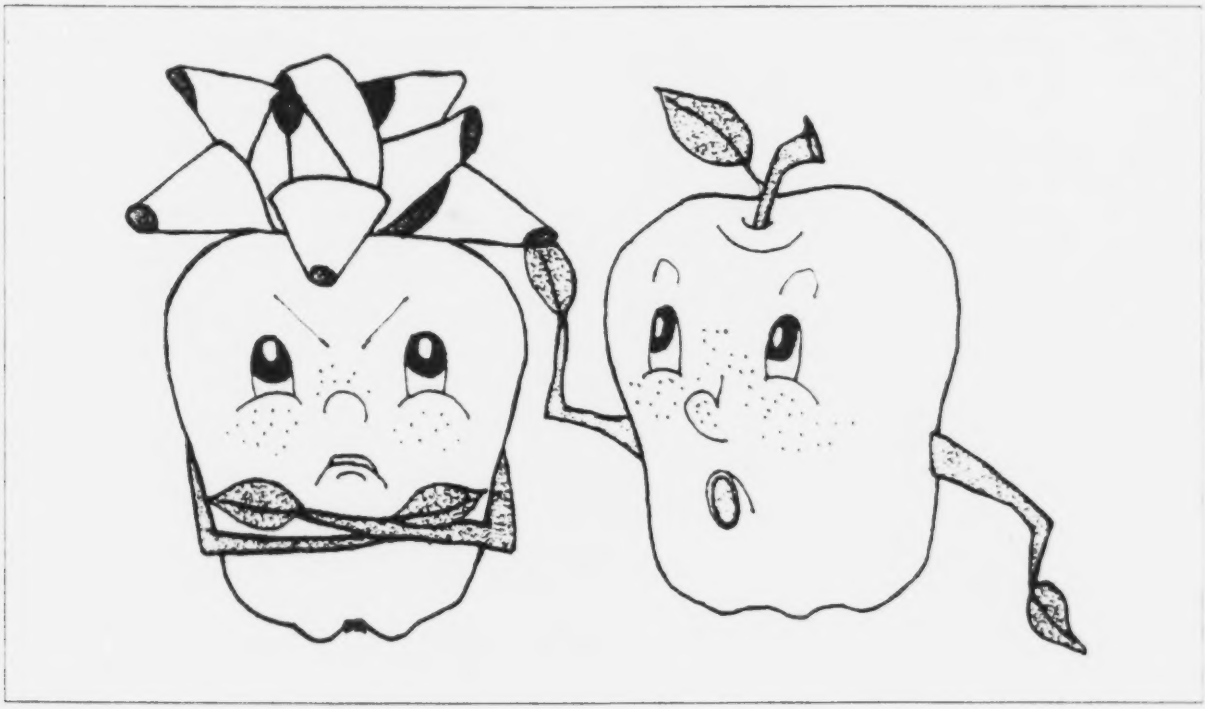
Some types of glass, such as window panes, Pyrex, and light bulbs are made by different processes and can't be combined with cullet.

The Wrong Package

The burgeoning solid waste problem reflects a trend in lifestyles... that emphasize shopping convenience, quick preparation and consumption, and easy disposal. Since 1960 the waste generated by packaging has increased more than 200%

--Renew America

Peanut Productions



OBJECTIVE:

The learner will identify excess packaging and will offer alternatives to such packaging which are healthier for the environment.

ACTIVITY IN BRIEF:

Learners are offered a choice between two identical products; one with an "attractive" package and the other without packaging (a plain apple and an apple with a pretty bow). They will design a package for a peanut in the shell and then will analyze the influence of advertising and packaging upon their purchasing choices. Finally they will evaluate packaging in relationship to our natural resources and waste disposal problem.

MATERIALS:

2 apples, bow, peanuts, assorted paper, ribbons, craft materials, samples of over-packaged items, colored markers/crayons, tape or glue, old bed sheet or tarp

GRADE: K-6

SUBJECTS: art, social science

TIME: 60 minutes

GROUP SIZE: any size

SKILLS: analysis, evaluation, description, invention, discussion, writing

VOCABULARY: consumer, advertising, resources, petroleum, landfill, composting

CONCEPTS: Wastes are produced in manufacturing products. People can learn to purchase products to avoid waste. Each citizen can reduce the volume of waste produced. Citizens as well as industry have responsibilities for waste management.

Peanut Productions

PROCEDURES: Two apples are displayed. They are identical to each other except one is wrapped with a pretty bright bow. The learners are asked which apple they would prefer. (It is highly likely the apple with the bow will be chosen.) Discuss briefly the power of packaging:

1. Why did you choose the one you did?
2. Which one would sell better in the supermarket and why do you think so?

Describe or display some products which have appealing packages (cereal boxes advertising games or prizes, snack cakes, beverage containers, etc.).

1. What makes these appealing? (colorful, "big" names, offers of prizes, trends, etc.) Make a list.
2. What is the purpose of packaging? Make a list of reasons for packaging. (i.e., protection from breakage, sanitation, food preservation, uniformity for display, shoplifting prevention, etc.)

Give each learner a peanut in its shell. The learner will create a package to market this peanut, using any scrap materials available. (old wrapping paper, ribbons, bows, little boxes, craft materials, etc.. The students may want to help collect these items. Also have scissors, glue, tape, and markers available.)

The peanuts will be displayed for all to see. You may want to do the first part of the activity in the morning so that the peanut packages will be displayed for most of the day.

Three people will be selected to be the "test" consumers. Each will select a packaged peanut from the display. Stress the importance of not hurting feelings in this activity. Negative comments are not acceptable. Only positive comments regarding choices made will be accepted.

Ask each test consumer the following questions:

1. Why did you choose your particular peanut? On what did you base your decision? (Note that the choice is very personal and may be based on something as simple as favorite color, attraction to a famous personality, etc.)
2. If this peanut cost more than the other peanuts, would you still buy it? Sometimes do people buy products based on the package without consideration of the price or quality? Consider brand names vs. generic.
3. What will you do with the packaging after you open the peanut?

Dispense the remainder of the peanut packages so every one has one. (or let each learner trade his/her package with another.) They can now open their peanut package, eat the peanut, and toss the packaging (including the peanut shell) on a sheet in the middle of the floor for all to see. Discuss the following questions:

1. What problems have been created by the mess in the middle of the floor?
2. What will be the fate of this trash? Where will it end up?
3. What resources have been used to produce the various forms of packaging? (Don't forget the energy connection such as petroleum for transportation, manufacturing, etc.) Make a list.
4. Was this packaging necessary? (Did it need a package at all?)
5. Can anything be done with the left-over packaging other than sending it to the landfill?
6. What can we as consumers do to discourage this waste of resources and landfill space? (Refuse to buy products with wasteful packaging, write to companies requesting environmentally sound packaging, etc.)

If any materials can be recycled or reused, salvage them at this time. When all options are exhausted, remove what cannot be recycled or re-used and put aside. Give each learner a second peanut and state, "Here is a package designed and produced by Mother Nature." Have the learners open this package, toss the shell in the middle of the floor, eat the contents, and then contrast this packaging with the former. Repeat the series of questions with the emphasis on comparing the two packaging styles.

1. What other products come wrapped in nature's own packaging? (bananas, oranges, etc.)
2. Can these natural packages by recycled? Brainstorm. Could we compost the empty peanut shells? (Explain composting!)

Some packaging is necessary to keep a product fresh, safe or "contained". Think of some examples (bread, milk, meat, medicines).

MY LITTLE BIT: I will volunteer to wash bread wrappers and other plastic bags at home. I will encourage my family to take them to the grocery store to sack up such items as fruits, nuts, and vegetables which need to be bagged. Reusing plastic bags will save petroleum.

WE CAN MAKE A DIFFERENCE: We will look for examples of products which are over-packaged and make a list of those products. We will design a better package for one of the more offensively wrapped packages. We will send our suggestions to the manufacturer or company, politely encouraging them to consider our ideas.

EXTENSION: Approximately $.11 out of every dollar spent goes to packaging (DNR). Collect prices of items in stores and supermarkets and develop mathematical problems regarding costs of packaging to the consumer. How much is spent on groceries alone each week? Speculate how much is spent for packaging per family per year.

EVALUATION: The learners will state the packaging considerations they should weigh before purchasing an item.

BACKGROUND: There are many arguments for and against various kinds of packaging, and information comes from many sources which makes it very confusing for consumers to make wise choices. Because each person throws away 440 pounds of packaging each year, the subject of overpackaging is important enough to spend time sorting out the issues and clarifying values.

No one type of packaging is always correct and each product should be considered individually. However, there are certain trends in packaging which lead to more package waste than others, such as single servings or prepackaged microwaveable meals. Nonfood items also tend to be overpackaged. It can be enlightening to examine how other nations package similar

products. There are often differences between different brands of the same product.

One quick way to determine if a product is overpackaged is to count the number of separate layers that surround the item. Considering the amount of packaging needed to preserve and protect the item, there are few products that actually need more than one or two layers of packaging. Often, the less essential a product is, the more it tends to be overpackaged, so counting the layers helps identify wastefulness in more ways than one.

Another consideration of wastefulness is the useful life of a package - whether it is refilled, or used briefly and discarded. Refillable containers really are "waste fighters". The most familiar and common refillable container is the soft drink bottle, but the same principle is being applied to some farm chemical containers, and bottled drinking water.

Try to learn about the basic material found in a package. Is the resource used a renewable resource or a nonrenewable resource (see glossary), and does the processing of the resource contribute to environmental pollution at the processing point? For example, plastic comes from petroleum, a limited, nonrenewable resource. Paper fibers come from trees, but the processing and bleaching to produce perfectly white paper tends to be a source of pollution around the mills.

Are there really good arguments for a particular package style? Consider that for the retailer, the package can do the following things: advertise and promote, simplify stacking and storing, preserve and protect, standardize portions and dispensing, discourage shoplifting or vandalism, and provide instructions or information. Who pays for the cost of the package, the cost of disposal, and who benefits most from the package? Examining your answers to those questions may lead you to create a packaging solution to benefit the environment, manufacturers, and consumers alike.

Litter Do We Know!

OBJECTIVE:

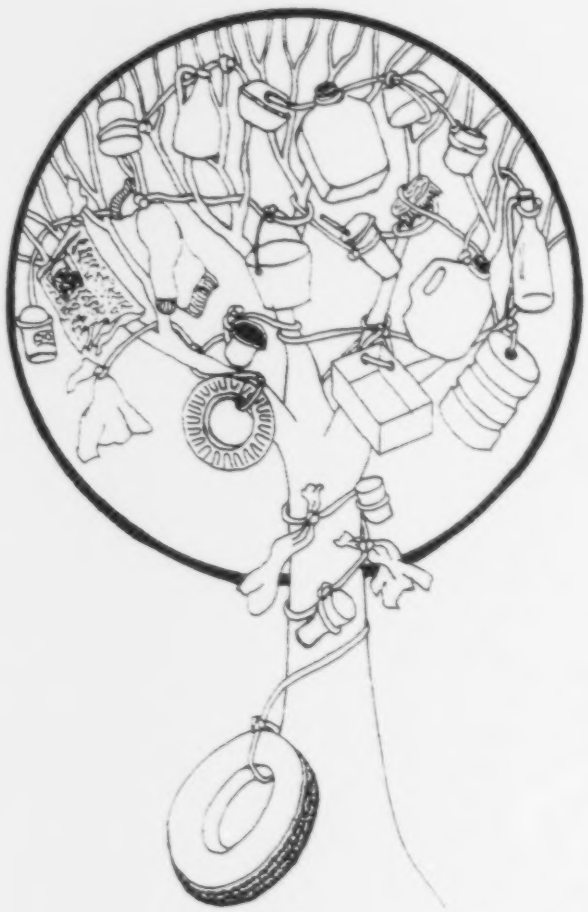
The learners will be able to identify litter which can be recycled and will create other uses for items generally thrown away.

ACTIVITY IN BRIEF:

The learners will come upon litter which has been tossed all about the room and they will discuss the negative impact of the litter upon humans and wildlife, as well as the wastefulness of throwing away items which could be recycled or reused. They will collect litter and will turn it into a display encouraging others to be responsible with the earth's resources.

MATERIALS:

litter! (see procedure), 5 bags, net bags, large sheet, pillow case/per learner (optional), twine



GRADE: K-6

SUBJECTS: language arts, science, social science, art

TIME: 30-45 minutes

GROUP SIZE: any size

SKILLS: classification, discussion, invention, public speaking, small group work

VOCABULARY: litter, recycle, sand, polystyrene, oil, metal, plastic

CONCEPTS: Most materials can be recycled in ways to prevent them from becoming litter.

Litter Do We Know!

PROCEDURE: Scatter the following kinds of things throughout the room: polystyrene cups and plates, paper cups, pop cans, glass containers, tin cans, candy wrappers, plastic containers, a tire, baggies, bread wrappers, paper, newspaper, half eaten peanut butter sandwich, cigarettes and their wrappers, a holey sock, and other assorted "stuff". (If there are ctitters such as fish, hamsters, etc., in the room, place items in their homes which would be harmless if left there for 30 minutes or more.)

When the learners enter the room, they will discover, much to their surprise, a room which has been trashed. After the "what's going on around here and who did THIS?" kind of questions, ask them how they feel about the mess. How will the animals be affected? How will the humans be affected?

Write on the board and discuss the following chart:

PLASTIC	Petroleum	From the ground
PAPER	Trees	Grown in the soil
ALUMINUM	Bauxite	From the ground
STEEL	Iron	From the ground
TIN	Tin	From the ground
COTTON	Cotton plant	Grown in the soil

Demonstrate how to distinguish aluminum from tin or steel cans. (Aluminum is NOT attracted to a magnet; bimetal tin and steel cans ARE.)

Divide the learners into 5 groups (plastic, paper, aluminum, tin and paper). Give each group a collection bag. One person from each group will hunt for their assigned item and then bring it back to the group. (Give magnets to the aluminum and steel representatives.)

Call time after 30 seconds and send out a new search party. Do this until almost all the litter is collected.

After all the "known" trash is picked up, give each group five to ten feet of twine to tie the trash together in a long chain. (Little net bags may help the GLASS group more easily attach the glass to the twine.) Have them space the items at least a foot apart.

Appoint garbage collectors to gather all the remaining trash. (This "unknown" garbage can then be dumped onto a sheet, discussed and sorted according to resource type.) Allow the respective groups to tie on any additional items.

Let each group display their chain and answer these questions:

What are the items made from?
Could some of the items be used again?
Could some of the items be recycled?
How could it affect wildlife or people if the items were left in the environment?

Tell them that all the items (resources) come from the earth and when we recycle or reuse an item, we are saving resources. When we recycle or reuse instead of littering, we are protecting the wildlife from harm.

Tie all the lengths of twine together to represent the earth and the resources we all share. The learners could march through other classrooms and explain the importance of sorting garbage for recycling to conserve our resources.

Display the chain by draping it in a tree, if one is available, or drape the chain into a spider's kind of web. Make a sign such as:

Recycle or reuse every litter bit!
A spider would take better care of its home!
Litter today, lose tomorrow!
Recycle for a Litter-less world!

MY LITTLE BIT: I will decorate a pillow case or other durable bag to be used as a litter

collection bag (The Earth-Saver Bag). I will carry it back and forth to school and collect items which could be recycled or reused.

WE CAN MAKE A DIFFERENCE: We will create litter bags out of old bread wrappers or other plastic bags. We will distribute them to friends, families, or local businesses. We will each make a card of information to include with the bag relating the following information:

Materials which can be recycled.
Why it is necessary to recycle.
Why littering hurts all of us.

EXTENSIONS:

1. Read "Litterbugs Come in Every Size" by Norah Smaridge, Golden Press, Wisconsin, 1972. Make a bulletin board. (See Extension)
2. Read "Sarah Cynthia Sylvia Stout Would Not Take The Garbage Out". (See Appendix)
3. Create a collage of interesting textures from the litter. Glue the pieces to posterboard scraps. The textures can be emphasized by painting over the collage with one color of paint.
4. Some items are not easily taken out of the waste stream even though it seems they should be. For example, not all recycling centers will recycle plastic bags. By allowing students to create or discover alternative uses for these objects, some may be kept from the waste cycle, and in doing so may reduce consumption at the retail level. With this in mind, let the learners brainstorm a list of ideas for old bread sacks. List those ideas on the board. Let each learner (or group) choose one way to use a sack and then implement the sack that way. Directions could be written for each implementation and all the ideas collected in a book to be placed in the library. A book review could be made in the local newspaper with pictures of some of the inventors with their bread sack creation.

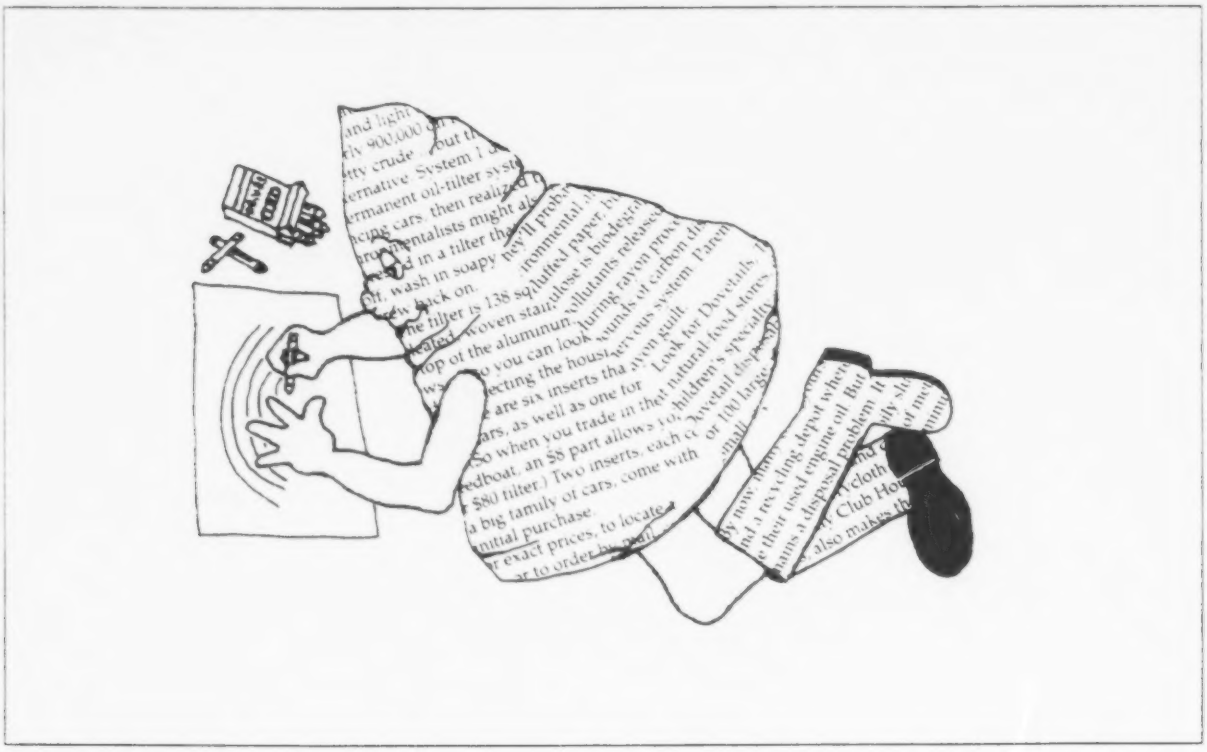
EVALUATION: Use the recycling information cards created in WE CAN MAKE A DIFFERENCE for an evaluation tool.

Common Sense

Other industrial countries produce half as much trash per person as we do, and recycle a major portion of it... The cheapest and safest ways to deal with trash are those that make common sense; producing less waste and recycling more.

--1988-89 Annual Report, The Environmental Defense Fund

Crayon Trash Stash



OBJECTIVE:

The learners will look at ways resources are wasted and will consider alternatives to "trashing" their used, broken and worn-out items.

ACTIVITY IN BRIEF:

Learners will sort their crayons into two piles; perfect and not perfect. The imperfect crayons will be stashed as trash. They will then be given the task of creating a picture of a rainbow with the perfect crayons remaining. The learners will speculate what their pictures might have looked like if more crayon colors had been available. Other items commonly thrown away will be re-evaluated for their reuse value.

MATERIALS:

learner's crayons or a large paper box of used crayons

GRADE: K-6

SUBJECTS: art, science

TIME: 30-45 minutes

GROUP SIZE: any size

SKILLS: description, analysis, evaluation, discussion, invention, writing

VOCABULARY: trash, landfill, recycled

CONCEPTS: People sometimes generate waste due to convenience. Most materials can be recycled. Responsible waste management promotes values consistent with respect for the earth.

Crayon Trash Stash

PROCEDURE:

1. Distribute a handful of crayons to each learner. Some crayons will be brand new and some will be used, worn and broken. Ask the learners to sort their crayons into two piles; Perfect or Imperfect.

2 Ask them to describe their most imperfect crayon. List responses on the board to be used later. Tell them that their imperfect pile of crayons is "trash," and they are to stash their trash in the landfill (inside their desks or into a sack).

3. Now, using only the "perfect" crayons, learners are to create a "perfect" rainbow and sky picture.

4. Display the rainbow pictures. What problems occurred because of the limited resources?
   (1) Did you wish you had more colors to work with?
   (2) Do you wish you had not thrown away the imperfect colors?
   (3) Do we sometimes throw other things away that we think are imperfect? Name some and record a list on the chalkboard.
   (4) Why do we throw things away? Make a list of reasons.
   (5) Look again at their words which described the imperfect crayon. Are these some of the same words we use to describe the items which we throw away.

5. Tell them:

   "Once something is taken to the landfill, it usually stays there forever, but in this case, you will have the rare privilege of reclaiming the crayons from the landfill." Let them add to their pictures. Once this is done, the learners will be given the opportunity to rethink how these crayons can be reused or recycled. Some ideas are to make: Sun Catchers, Candles, Rainbow makers, etc. (See PROJECTS.)

MY LITTLE BIT: I will identify something I own which I would ordinarily want to throw away, and I will turn it into something useful. I'll either keep it or give it to someone else.

WE CAN MAKE A DIFFERENCE: We will organize a "Trash to Treasure" center which will become a permanent part of the classroom. Materials ordinarily thrown away will be collected and stored here to be used in art projects and other activities, or to be turned into something useful for someone else.

Another center, the Swap Shop, would be an ongoing activity. Here learners can donate or trade toys, games, clothing, etc., which would otherwise have been trashed. (See "Designing A Re-think Classroom" Pages 1 and 2)

EXTENSION: Plan a "Trash to Treasure Fair" for the school. (Suggested categories for entries: An item recycled, An item repaired, An item reused) The rainbow pictures can be turned into advertising posters and awards can be made from "throw-away" materials. (A visit to a Goodwill or second hand store would be useful.)

BACKGROUND: Some crayons are made from the fat or tallow of hogs or cattle. This is a byproduct, or a reclaimed product, from the livestock industry. Others are petroleum based.

PROJECTS:

Sun Catchers

Crayon Trash Stash

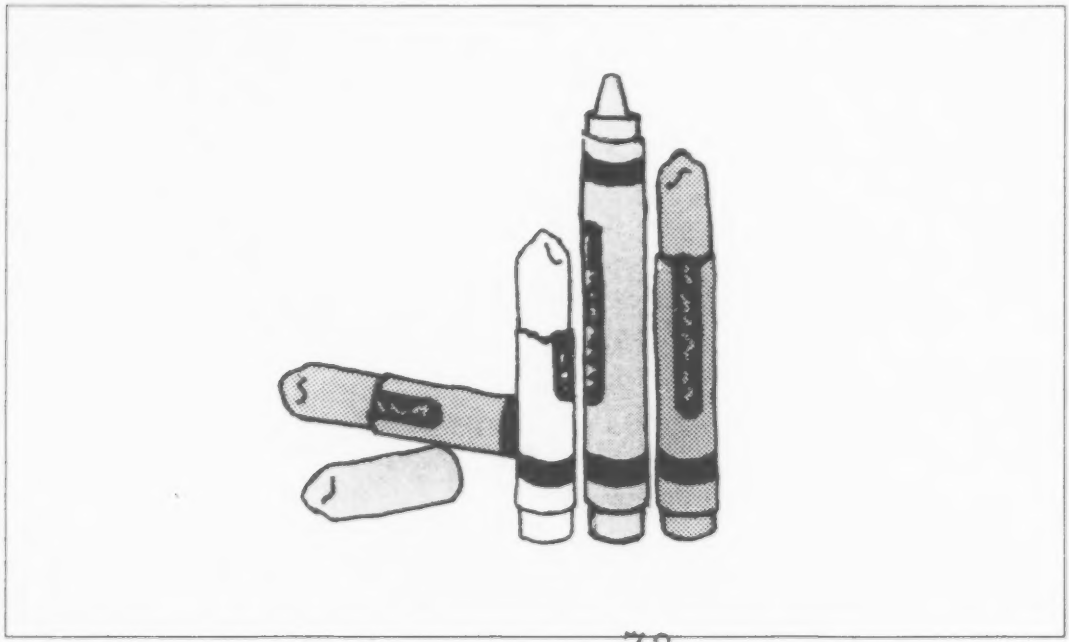
Materials: used crayons, medium hand kitchen grater, wax paper, irons, pad of newspapers, brown paper sack cut open (Ask for extra adult volunteers on this day. Perhaps they could bring their own irons.)

Procedure: Have the learners remove paper from crayons. Ask an adult volunteer to grate the crayons into separate colors. The learners will sprinkle crayon shavings on top of a sheet of wax paper, keeping colors separate. Cover with a second sheet of wax paper making a sandwich. Prepare a pad of newspaper to protect surface from iron. Cut open a brown paper sack and lay on top of newspaper for a blotter. Lay wax paper sandwich on brown paper and newspaper pad. Cover sandwich with another piece of brown paper. Using a medium hot iron, melt the two layers of wax paper together. This will also melt the crayons, creating a stained glass effect. After cooling, the sun catcher can be cut into a shape (butterfly, fish, flower, etc.) either by tracing a shape first or by cutting free-hand. (A mobile of many shapes can be made or they may be hung in a window.)

Crayon Votive Candle

Materials: candle wax, used crayons, candle wicks, pencil, baby food jar, soup size tin cans, pot holders, electric fry pan

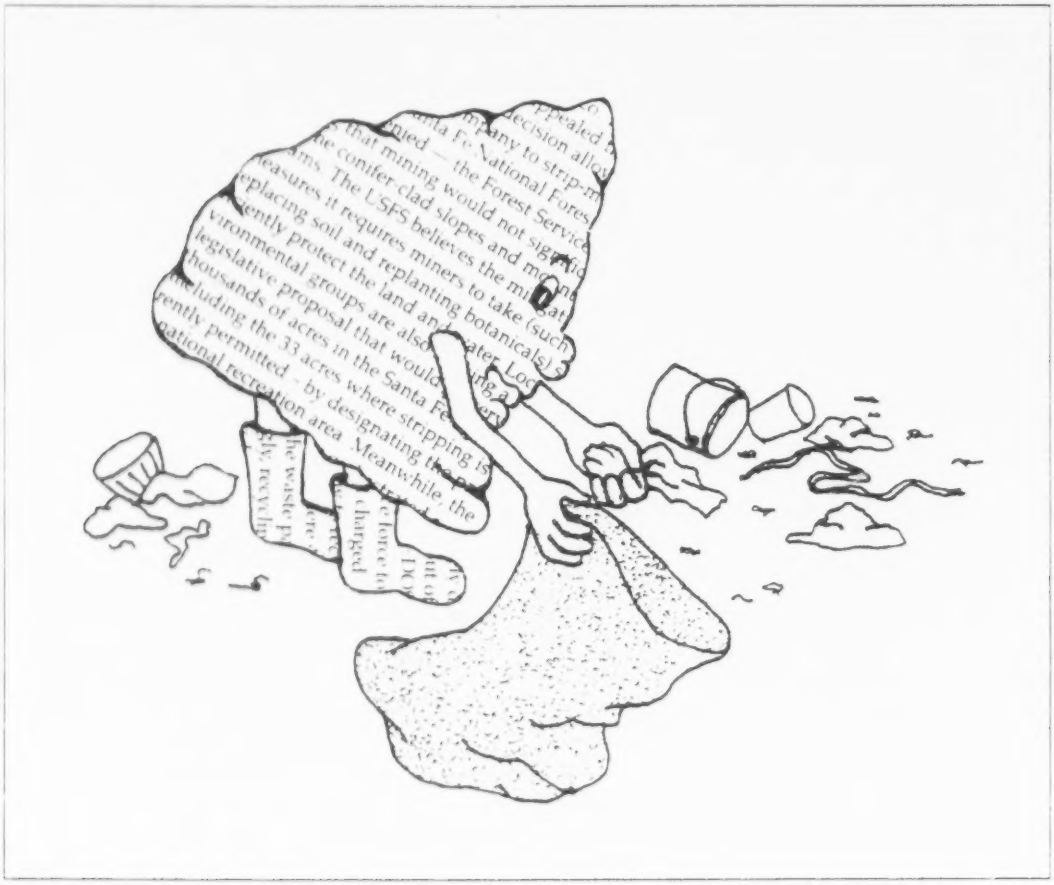
Procedure: Clean and dry baby food jars. Using a four inch piece of candle wick, tie the wick in the middle of a pencil. Rest the pencil across the jar opening with the candle wick hanging inside the jar. Students are to remove paper from crayons and sort by colors into tin cans. Add candle wax to each color to fill the can one half full. Set cans in electric fry pan on low to medium heat. When melted, pour a 1/2 to 3/4 inch layer of color in each jar. Let cool until set enough that a layer of another color can be poured on top. Continue to layer the colors until the jar is full. After candle is completely cooled, students can trim candle wick to 1/2-1/4 inch. Prepare a tag stating that this gift was made from reused glass and recycled crayons and tie around the candle. This is a nice gift for Mother's Day.



America has for a long time taken the cheapest option in waste disposal: 90% of its rubbish is simply dumped in landfill sites and buried. But landfill sites are filling up; a third have closed since 1980. More than half the cities on the east coast will run out of room by 1990. In New York 14 sites have closed in the past ten years. All of Seattle's sites will soon be full.

--The Economist

A Sticky Situation



OBJECTIVE:

The learners will be able to list several reasons for separating their garbage at the source in preparation for recycling.

ACTIVITY:

A mixture of "garbage" and recyclable items will be separated, sorted, and prepared for recycling and composting.

MATERIALS:

an assortment of recyclable items (see procedure), six containers, paper/writing utensils

GRADE: 4-6

SUBJECTS: science, language arts, social studies

TIME: 35-45 minutes

GROUP SIZE: any size

SKILLS: classification, evaluation, invention, small group work, discussion, kinesthesis, concept development, media construction

VOCABULARY: recyclable materials, sorting, screening, magnetic pickup, winnowing, floating, sinking, separation at the source, biodegradable, compost

CONCEPT: Citizens have responsibilities for waste management. Most materials can be recycled and some can be collected and processed in ways which reduce their volume or divert them from the waste stream.

A Sticky Situation

PROCEDURE:	Display examples of items from each of the following categories:
PLASTIC:	plastic bags, lids, bottles, polystyrene items
GLASS:	marbles, small jars and bottles
METALS::	aluminum foil, pop tops, lids, cans
PAPER:	cardboard, scrap paper
YARD WASTE:	small sticks, leaves, grass clippings
FOOD SCRAPS:	one-half cup each of cottage cheese, yogurt, peanut butter, apple sauce

Display six empty containers labeled as follows: GLASS, METAL, PAPER, PLASTIC, FOOD AND YARD WASTE, GARBAGE

Begin the activity by picking up a piece of aluminum foil and saying, "This will become a wrap for a baking potato. What will happen to this wrapping after someone finishes eating the baked potato?" (thrown away or recycled?) For either response, throw PART of the foil into the METAL container and the rest into the GARBAGE container.

Continue this questioning until all the materials have been sorted. When the process is complete, all materials must be present in BOTH the garbage and the appropriately labeled containers.

Now hold up the garbage container and pour the contents into a plastic bag. Tie the bag closed and simulate what will happen to the garbage in reaction to the learners' responses to the question, "What will happen next?"

1. Garbage is taken out. (Bag is dumped in waste can.)
2. Garbage is picked up and compacted in truck. (Squeeze the bag.)
3. It is dumped into the landfill and covered with dirt and is compressed even more. (Cover it with a towel and squeeze again.)

STOP! and say, "But wait a minute! Before burying this stuff where it will remain for thousands and thousands of years, is there a better way?" Of course, RECYCLE is the anticipated response! And we could COMPOST yard and vegetable food scraps.

Ask for 3-4 volunteers to come forward. Hand them the garbage and tell them to separate the stuff (on a plastic or wax sheet). After the"yuks and blechs" occur, discuss the best procedure for separating the materials. Follow with a discussion of the various methods of separating garbage.

Gather some information about the various ways energy recovery systems separate garbage (i.e., screening, hand separating, washing, sinking, floating, winnowing, and magnetic pick up). NOTE: Energy recovery systems separate the garbage and incinerate all burnable trash in order to make energy. Point out the fact that there are many environmental problems associated with incineration of garbage, and it is questionable whether the amount of energy recovered outweighs the damage done to the environment. (In a nutshell, it prevents reuse or recycling of combustable items.)

Point out the physical danger to workers, including contact with hazardous materials and broken glass, disease ridden contaminants, and the use of additional resources of energy and water if mechanical methods are used.

So the question remains:

"WHY IS IT ADVANTAGEOUS (better) TO SEPARATE GARBAGE AT THE SOURCE?" Make a list of reasons.

MY LITTLE BIT: I will help establish a compost center in my yard and will volunteer to water and stir it weekly. I will clean and immediately sort all recyclable items as I use them.

WE CAN MAKE A DIFFERENCE: We will make posters for the food service employees thanking them for recycling glass and metal containers. We will thank them for taking care of the resources for our future.

If possible, we will invite some retired or interested gardeners to help make a compost center for our food scraps. We could make good rich soil for a compost demonstration to the community.

EXTENSION: Learners could create and illustrate a mechanical device for separating garbage with a "Rube-Goldberg-type" contraption or they could research some of the more serious methods of garbage separation such as the Iowa based Luddell System.

EVALUATION: Each learner will prepare a letter about the importance of separating and recycling "garbage". It will be read to a younger child in another class to help encourage the recycle ethic. Each child could read his/her letter on video or cassette tape, and the compiled readings could be made available to be checked out from the school library.

BACKGROUND: Various technologies are discussed for handling garbage that is not presorted by the household or business. Sometimes these system are promoted because they do not require any change in our habits. All garbage is hauled to a facility after being picked up and compacted in trucks just as garbage is hauled today. These mechanical methods require large, continuous quantities of garbage to operate cost effectively. Sometimes they are called MRF's or materials recovery facilities. They are usually located in areas of large population.

Most often the garbage is loaded on a large conveyor system which takes it past various types of human sorters, magnets, grinders, and blowers. Any recyclables separated out of the garbage are sold. Some MRF's also separate and process compostables. The remainder of the garbage is perhaps processed into a fuel which may be sold if a market can be found.

In Iowa, in 1990, there were three facilities in operation which processed unsorted garbage into refuse derived fuel (RDF). Two produced a fuel pellet composed of paper and some plastics. Because the pellets failed early air emissions tests they could not be sold in Iowa (only one company was permitted to burn a small mixture of the pellets with coal, or about a semi-truck load per week). The other facility produced a fuel which was not compressed, called fluff, which was sold directly to the municipal power company bound by contract to buy and burn the fluff. This system in Ames was built in the 1970's with funding assistance from various sources.

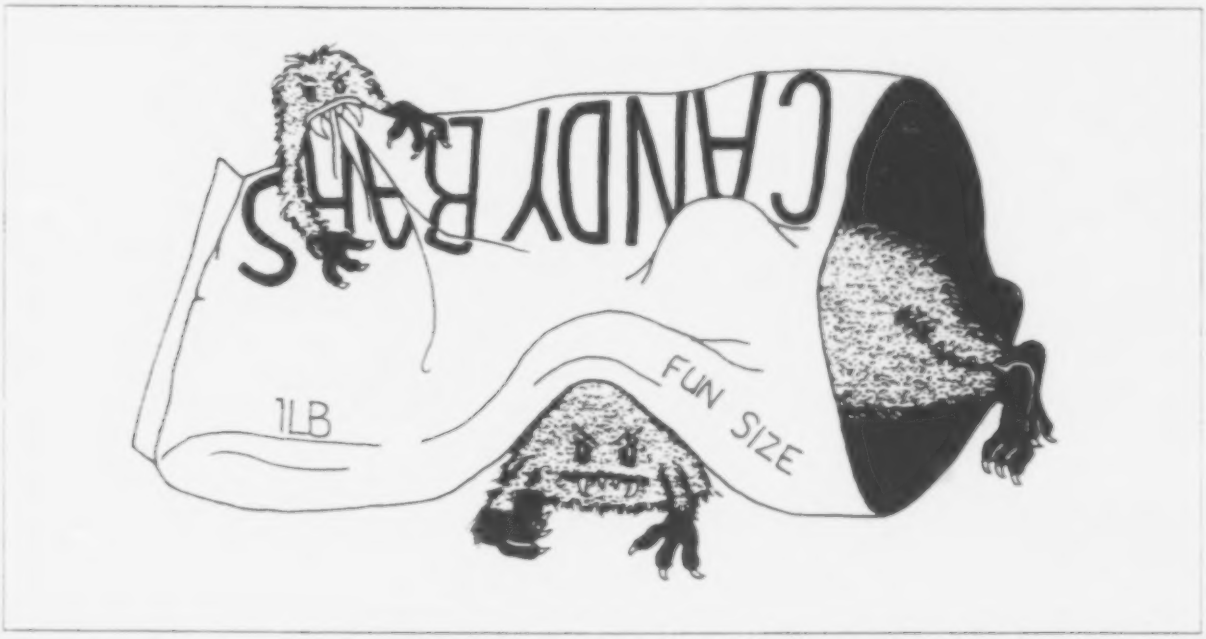
As with recycling, some problem products cannot be processed in a MRF, such as appliances, tires, motor oil, or household hazardous wastes. Also, as with recycling, poorly sorted or contaiminated loads of materials can be difficult to sell and may end up in a landfill.

RDF can be a way of utilizing resources which cannot be recycled effectively. For example, dirty paper such as paper towels, or a newspaper used when cleaning fish, or carbon paper can all be used in RDF, but not recycled.

We are each a part of each other -- and each a part of all that is. There is a way to remember this. Next time you eat a candy bar, think of this: the chocolate may have come from Ghana, the peanuts from the Sudan, corn syrup from Iowa, sugar from Ecuador, butter from Australia, paper from Canada, fruit from Israel. If it was wrapped in tin foil, that probably came from Thailand and the coconut from the Phillipines. Add all the people together who helped make that candy bar, and it's thousands all over the world who have contributed to your enjoyment.

--Rolland Smith, Anchorman, WWOR-TV
UN Youth Environment Forum Keynote Speaker
UNEP North America News, June 1991, Vol. 5, No. 3

The Hidden Gremlins



OBJECTIVE:

The learner will analyze the hidden costs to society and to the environment of purchasing a bag of candy bars. The learner will be able to transfer that information to other areas of their buying habits.

ACTIVITY IN BRIEF:

Learners will become part of a skit where "Gremlins" point out the hidden costs of a bag of candy.

MATERIALS:

6 Gremlin cards, 6 Banker cards, 1 Store Clerk card, 1 Recordkeeper card, Society cards as needed, bag of candy bars

GRADE: 4-6

SUBJECTS: language arts, math, social science, science

TIME: 60 minutes

GROUP SIZE: 15 or more (ideally)

SKILLS: computation, application, listing, public speaking, writing, small group work, synthesis, research

VOCABULARY: tropical rain forest, pesticides, hidden costs, petroleum

CONCEPTS: There are intangible costs to consumption of materials and disposal of waste.

Hidden Gremlins

PROCEDURE: A bag of individually wrapped candy bars is displayed. A list is made of the main ingredients used in making this product, including the packaging materials used.

Reduce the ingredients to their basic raw resources and where these resources may have been obtained. Example:

chocolate	cocoa plant	tropical country
sugar	sugar cane	tropical country
vanilla	vanilla bean	tropical country
plastic wrapper	petroleum	Alaska or the Middle East
paper wrapper	trees	Forest States or a foreign country

Now make a separate list of the materials and resources needed in growing the plants, in transporting the materials to the processors, and in making (processing) the candy and the wrappers.

Growing the plants:

water
soil
nitrogen
herbicides
pesticides
gasoline to run equipment
farm equipment

Processing:

candy-making materials and machinery
plastic-making materials and machinery
paper-making materials and machinery
energy to run the machinery

Transportation:

cocoa from field to the processor
sugar cane from field to the processor
petroleum from ground to the processor
trees from forest to the processor
vanilla from the forest to the processor
processor to market to home

Other:

air pollution caused by factories
air pollution caused by vehicles
water pollution caused by fertilizers, herbicides, etc.
water pollution caused by factories
roads to the forest to the market to the homes
destruction of wildlife habitat

Consider the damage that may have been caused by these processes to the land, air, wildlife, water, etc..

Questions:

1. How much does the package cost?
2. Who will pay for the building of roads to transport the raw materials and finished product?
3. Who will pay for the clean-up of the polluted air and water?
4. Who will pay for the destruction of wildlife habitat?

A cast is selected and the following script is read first silently, then outloud. Six people will be "Gremlins", six will be bankers, and there will be one bookkeeper, one store clerk and one buyer. The remaining learners will be society.

The Case of the Hidden Gremlins

A person enters the store and picks up a bag of candy bars. Suddenly, out of the clear blue sky, come voices.....

SOCIETY: "Inquiring minds would like to know.....
For that little bag.....How much dough?"

Store clerk: "$3.00!" (Bookkeeper writes it on the board.)

Gremlin #1: "Are YOU sure?????? Did you forget where chocolate comes from? I THOUGHT SO! Chocolate comes from cocoa plants grown in tropical countries. A road was built to get the cocoa from the tree to the chocolate factory in the United States. I'm the transportation Gremlin, and I demand my money!"

Banker #1: "The cost of the road is $15,000,000. The government of Brazil owes the world bank $15,000,000 to pay for that road. SOMEONE HAS TO PAY!"

Bookkeeper: "OOOOOOOPS! I'd better add $15,000,000 to the tab." (The bookkeeper will add the new figure on the chalkboard for all to see each time the cost is increased.)

SOCIETY: "Inquiring minds would like to know..... For that little bag.....How much dough?"

Store clerk: "$15,000,003!"

Gremlin #2: "Are YOU sure?????? Did you forget about the pesticides that were put on the cocoa plants to keep the bugs away? I THOUGHT SO! Well, let me tell you! The pesticides are polluting the water and now clean H2O is running low. I'm the dirty river Gremlin, and I demand my money!"

Banker #2: "The cost of a new water treatment plant will be $950,000. SOMEONE HAS TO PAY!"

Bookkeeper: "OOOOOOOPS! I'd better add $950,000 to the tab."

SOCIETY: "Inquiring minds would like to know.....For that little bag.....How much dough?"

Store clerk: "$15,950,003!"

Gremlin #3: "Are YOU sure??????? Did you forget about the new oil drilling after the war? I THOUGHT SO! Our country needed new sources of oil to use in transporting the cocoa. I'm the oil Gremlin, and I demand my money!"

Banker #3: "The cost of oil rigs and pipelines is $1,000,000,000. SOMEONE HAS TO PAY!"

Bookkeeper: "OOOOOOOPS! I'd better add $1,000,000,000 to your tab." (Add figures on the chalkboard.)

SOCIETY: "Inquiring minds would like to know...For that little bag...How much dough?"

Store clerk: "$1,015,950,003."

Gremlin #4: "Are YOU sure?????????? Did you forget about the extra petroleum needed to make the bag for those candy bars? I THOUGHT SO! Bags! Bags! Bags! The bag industry had to expand, more air pollution was created and people have more health problems. I am the bad

health Gremlin, and I demand my money!"

Banker #4: "The cost of increased health care is $5,000,000,000. SOMEONE HAS TO PAY!"

Bookkeeper: "OOOOOOOPS! I'll add $5,000,000,000 to your tab." (Add figures on the chalkboard.)

SOCIETY: "Inquiring minds would like to know...For that little bag...How much dough?"

Store clerk: "$6,015,950,003."

Gremlin #5: "Are YOU sure?????????? Did you forget about the trees that were cut down to make the paper wrapper? I THOUGHT SO! More trees need to be planted. I am the tree Gremlin, and I demand my money!"

Banker #5: "The cost of reforestation is $3,000,000. SOMEONE HAS TO PAY!"

Bookkeeper: "OOOOOOOPS! I'll add $3,000,000 to your tab."

SOCIETY: "Inquiring minds would like to know... For that little bag...How much dough?"

Store clerk: "$6,018,950,003."

Gremlin #6: "Are YOU sure?????????? Did you forget about the garbage created by the wrapper you threw away? I THOUGHT SO! Landfills are filling up and more land must be purchased. I am the dump Gremlin and I demand my money!"

Banker #6: "Land for a new landfill will cost $100,000. SOMEONE HAS TO PAY!"

Bookkeeper: "OOOOOOOPS! I'll add $100,000 to your tab."

SOCIETY: "Inquiring minds would like to know... For that little bag...How much dough?"

Store clerk: "$6,019,050,003."

Everybody: "WHO'S GOING TO PAY FOR ALL OF THIS?"

The person holding the bag turns his/her pockets inside-out, and with a shrug of the shoulders, puts the bag down and walks out of the store.

NOTE: The costs in the skit are speculation by the author, designed to stretch the imagination of the learner. The learner should be aware that, in reality, the cost is spread over millions of candy bars.

DISCUSSION:

1. A gremlin is someone or something that causes trouble or adds problems and confusion to a situation. What were the gremlins in this scenario? (List them.)
2. Could there be other gremlins? What are they?
3. Could any gremlin be eliminated so the cost could be reduced?
4. When a purchase is made, there are hidden costs that are not obvious at first. Someone has to pay for these hidden costs. Who pays?

The learners are divided into small groups.

Each group is given an item. The "gremlins" are developed for that item, and then each group will share their list. Opportunities to reduce costs are then brainstormed by each group and these are shared.

MY LITTLE BIT: I will THINK before making a purchase. I will ask myself, "What are the hidden costs? Do I really need this item? Is there anything I can do to reduce the hidden costs?" A sharing of experiences would be valuable as learners begin to evaluate their buying practices.

WE CAN MAKE A DIFFERENCE: We will write to a company that uses unnecessary packaging and urge them to eliminate it so that hidden costs to society can be avoided.

EXTENSION: Find out how much it costs to run a landfill or a water treatment plant in your local area, or to build a road or a pipeline in another country. Who pays? How are these costs passed on to society?

EVALUATION: The development of "gremlins" (hidden costs) for personal purchases will serve as the evaluation tool.

I have five senses
you must reach
if I'm to learn
and you're to teach.
With taste, touch, smell,
and sight so clear,
why must I receive all
sense by ear?

--C. Harold Fabler

The Recycle Hop

OBJECTIVE:

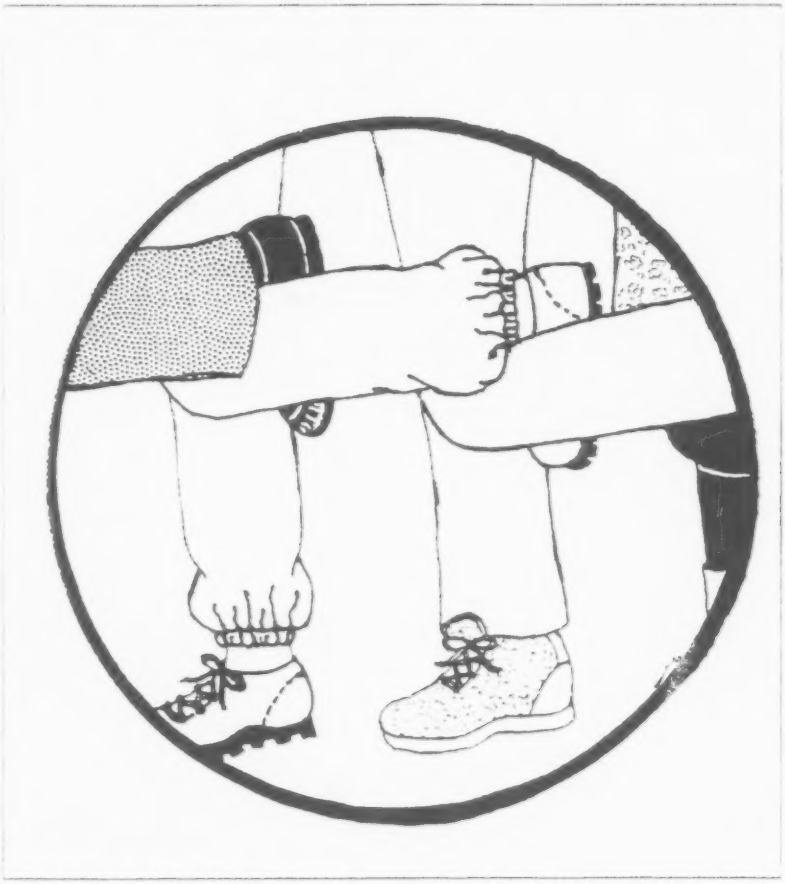
The learner will demonstrate the importance of cooperation by the various sectors of society in the waste reduction process. The learner will also describe ways in which each sector (manufacturer, retailer, consumer, school personnel, and politician) can reduce waste.

ACTIVITY IN BRIEF:

The learners will brainstorm ways industry, businesses, schools, politicians, and consumers can help reduce consumption and waste of natural resources. A game will be played whereby support will be felt when everyone cooperates. (Learners will hook legs and hop around a circle together.)

MATERIALS:

none



GRADE: 3-6

SUBJECTS: social science, P.E.

TIME: 30-60 minutes

GROUP SIZE: 5 or more

SKILLS: analysis, description, discussion, problem solving, kinesthesis, concept development, small group work, writing

VOCABULARY: manufacturers, retailers, consumers, school personnel, politicians, cooperation, reduce, recycle

CONCEPTS: Business, industry, private and public sectors must all work together to realize the benefits of recycling.

The Recycle Hop

PROCEDURE: Write these headings on the chalkboard: MANUFACTURER, RETAILER, CONSUMER, SCHOOL PERSONNEL, and POLITICIAN. Under each heading list well known and recognizable examples. (A simple job description may be helpful.)

Next, divide the learners into the various sectors (manufacturers, retailers, etc.) Each group will discuss ways its sector could reduce the vast amount of trash it throws away each day. A list of "WAYS TO REDUCE WASTE" will be made by each group. Each group will share its ideas with the whole group by displaying its list.

Now form a group consisting of one representative from each of the five sectors. This group of five will demonstrate.....The Recycle Hop!

1. Each representative in the group will state one waste reducing action which can be taken by his/her sector.
2. Say to them, "You are all so excited about reducing waste that you begin to hop up and down. But, being concerned about reducing waste, you make the effort to conserve and now you will hop on only one foot."
3. This is difficult to do by yourself! You need the support of others, so you will HOOK YOUR LEGS TOGETHER by lifting your right leg and hooking your right toes over the right calf of the person behind you. (The leader may need to help the last person with the hookup to complete the circle.)
   Once you are connected, you should begin to feel immediate support by having all persons, no matter what the occupation, work towards the same goal.
4. Show cooperation by putting your arms on each other's shoulders and/or waists. Now HOP UP AND DOWN TOGETHER keeping time to this chant (recited by all the observers): 'REDUCE, RECYCLE ONE! REDUCE, RECYCLE TWO! REDUCE, RECYCLE THREE!', etc.
5. You will be reducing waste each time a number is called out.
6. Now, HOP AROUND IN A CIRCLE. You will complete a successful recycling cycle with each complete rotation of the circle.

KEEP TRACK of the number of times your group can complete a successful rotation of the circle without breaking. When a breakdown occurs, GARBAGE is formed and the group has to wait fifteen seconds before it can get the process started and back on track again.

Which group is able to go the longest?

QUESTIONS:

1. Will The Recycle Hop work if someone along the way doesn't cooperate?
2. In what ways is The Recycle Hop like the recycling process?
   Review the process and the symbolism of The Recycle Hop:
   hopping on one leg: making the effort to conserve
   hooking legs together: cooperating with others
   putting arms around each other: more cooperation
   hopping in a circle: a successful recycling cycle
   chanting: support from the citizens!

MY LITTLE BIT: I will make the extra effort of writing to a local or state lawmaker to politely ask for support of waste reduction legislation.

WE CAN MAKE A DIFFERENCE: We will invite some of the "players" in the various

sectors of the community to attend an assembly where we will demonstrate The Recycle Hop. We will encourage them to cooperate in a recycling program.....like The Recycle Hop players!

EXTENSION: Have the learners teach The Recycle Hop to some other group, such as students in another class. Have them explain what the game symbolizes.

EVALUATION: The learner will name one or two things each sector (refer to the initial activity) can do to reduce solid waste. Explain how greater gains will be made when the sectors support and cooperate with each other.

BACKGROUND: Recycling occurs when a used product is collected and sent to a manufacturer who takes the used material and uses it to make another of the same product (or in the case of plastic uses it to make a different product) which is then sold again for use. The collection aspect of recycling requires cooperation to make the collection successful and efficient.

Densely populated areas regularaly generate large quantities of recyclables which are easily transported to manufacturers for reuse. Rural areas and small towns do not accumulate large quantities of recyclables very quickly and often have to pay large transportation costs to get their materials to a manufacturer.

In Iowa, there are few manufacturers who will buy or reuse collected materials. There are no manufacturers of glass. There is only one paper mill (located at Tama) which can only use a small percentage of Iowa's waste paper. There are currently four recycling plants in Iowa. The whole system works best when each of us takes responsibility to separate our recyclables and clean them at home or place of business. Manufacturers are better able to reuse the resources again and again when we have done our part to help.

Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
•Repaint • Rebuild • Reinvent • Recast • Return • Redefine
•Rejuvenate • Refashion • Remarkable • Recycle • Reuse •

Secondary Activities
Grades 7-12

Reinvent • Recast •Return • Redefine • Rejuvenate • Return
Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
• Repaint • Rebuild • Reinvent • Recast • Return • Redefine
Rejuvenate • Refashion • Remarkable • Recycle • Reuse •
Reinvent • Recast •Return • Redefine • Rejuvenate • Return
• Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
Repaint • Rebuild • Reinvent • Recast • Return • Redefine •
Rejuvenate • Refashion • Remarkable • Recycle • Reuse •
Reinvent • Recast •Return • Redefine • Rejuvenate • Return
Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
•Repaint • Rebuild • Reinvent • Recast • Return • Redefine •
Rejuvenate • Refashion • Remarkable • Recycle • Reuse •
Reinvent • Recast •Return • Redefine • Rejuvenate • Return
Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
Repaint • Rebuild • Reinvent • Recast • Return • Redefine •
• Rejuvenate • Refashion • Remarkable • Recycle • Reuse •
Reinvent • Recast •Return • Redefine • Rejuvenate • Return
Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
Repaint • Rebuild • Reinvent • Recast • Return • Redefine •
• Rejuvenate • Refashion • Remarkable • Recycle • Reuse •
Reinvent • Recast •Return • Redefine • Rejuvenate • Return
Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
• Repaint • Rebuild • Reinvent • Recast • Return • Redefine

Secondary Section
Order of Concepts

	Major Concepts	Activity
I.	An overview and the finiteness of natural resources, and waste generation.	Every "Litter-Bit" Helps! Resource Management - The Choice is Yours
II.	Current waste disposal practices and volume reduction.	How Much for the Wrapper Take Out the Garbage! Hold the Package Please Paper Recycling Expanding Habits Life Cycle Cost
III.	Landfill Problems and recycling.	I Can I.D. Can You? Making A Better Landfill Compost Delight The Three R's
IV.	Methods of reusing, reducing and recycling for waste management.	Jeans Don't Wear Out Ring Around the Can Recycled Art Cost (or Savings) of Reuse
V.	Waste costs and personal commitments.	Political Choices Recycling Poetry Paper or Plastic Lights, Camera, Action! Shop and Save!

Every "Litter-Bit" Helps!

OBJECTIVE:

The learner will be able to evaluate litter problems at specific community sites and develop possible solutions for community problems.

ACTIVITY:

Learners research litter sites in their community to encourage community action.

MATERIALS:

camera, film, community map, notebook, pencil/pen, polaroid camera

GRADE: 9-12

SUBJECTS: art, social studies, science, language arts, environmental problems

TIME: extended

GROUP SIZE: any

SKILLS: photography, group work, interpretation, evaluation, mapping, observation, reasoning, recording, problem solving, collecting data

CONCEPTS: I. There's no-away to throw things!

Every "Litter-Bit" Helps!

PROCEDURES: Hold a discussion of litter problems in your community. Assign learners to investigate areas of unsightly litter in their community for a week. At the end of the week, discuss the various areas and mark them on a community map. Make a list of the five worst sites, as decided by the participants. Discuss why there is a litter problem there.

Divide the group and have them take photographs of the areas. While the group is visiting the site to take photos, also determine the site's condition, the extent of the litter problem; list the types of litter, amount, and how it possibly got there. Display the pictures and have the students write reactions to the pictures and some of the facts gathered during the visit.

*Note to instructor: Make sure to secure permission before visiting private property sites.

Polaroid cameras provide feedback to researchers. Participants may have a polaroid that can be loaned, or your local photography shop may loan a camera for this activity.

Learners can monitor litter problem in a given area by taking pictures over a period of time. Clean site, if possible, and study how long it takes to become a "litter problem" again.

DISCUSSION POINTS: Is there a "trend" or "hot spot" in your community? How can it be solved? What can we do?

There are other concerns and crucial points about this litter issue. There could be an increase in ditch dumping as a result of increased costs and regulations for solid waste disposal. This is more than an issue of aesthetics. Who will pay for clean-up? This also causes a greater potential risk of hazardous dumps. How could ditch dumpers be identified? How can people be educated not to do so?

If citizen clean up days are initiated, who will pay the costs to dispose of what they collect?

How about a citizen who has angered some local vandals who then dump more garbage in the citizen's yard. How does that affect the citizen's ability to conform to recycling and littering laws?

MY LITTLE BIT . . . Learners write and send a letter with a picture and map of a community litter spot to Town Hall, the mayor, the highway department, etc., requesting action on the site.

WE CAN MAKE A DIFFERENCE. . .
Have your group explore an "Adopt a Highway" section of highway in your community to keep clean. Make sure to request that the large blue sign **not** be posted as it also distracts from the beautiful Iowa scenery!

Contact person for "Adopt a Highway" is Iowa Department of Transportation (#(1-515-239-1396). Some Iowa counties also have programs available - contact your county engineer.

EVALUATION: Pictures and captions displayed, drafts, and letters to community leaders can be used as evaluation tools.

EXTENSION: Research Iowa laws regarding littering. What are the maximum/minimum fines? What is being done? How much does litter cost us? How are funds collected from littering fines used?

Contact a local agency responsible for litter enforcement and find out the difficulties of enforcement. Lobby local and state government to beef up fines/enforcement/funding.

Have participants pick up litter on your meetings grounds and keep track of time. Determine the cost for cleaning up the liter by multiplying maintainances wages by time, by participant number.

Resource Management: The Choice Is Yours!

OBJECTIVE:

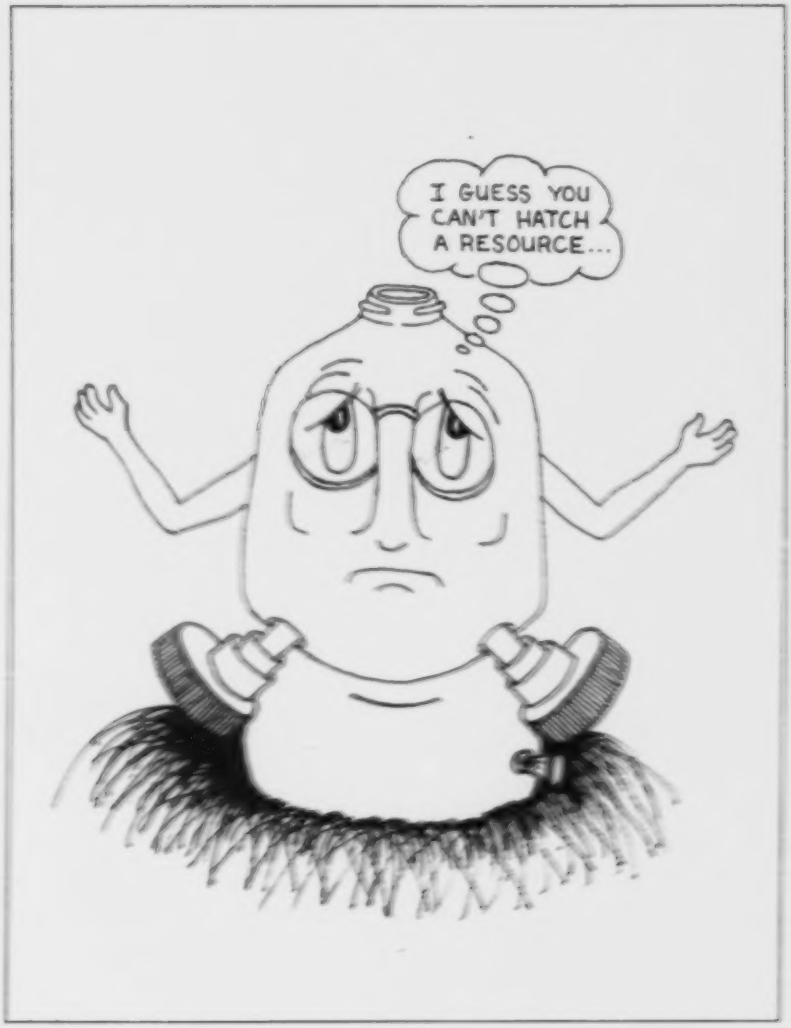
The learner will be able to analyze his/her choices in relation to use of resources.

ACTIVITY IN BRIEF:

Balloons are used to represent resource use/abuse to help learners define their habits and evaluate their choices.

MATERIALS:

2 water balloons tied with string for each learner



GRADE: 7-12

SUBJECTS: science, social studies, language arts, environmental eucation

TIME: extended

GROUP SIZE: any

SKILLS: evaluation, observation, critical thinking

VOCABULARY: resources, petroleum, landfill

CONCEPT: I. Citizens have responsibilities for resource use and waste management.

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Resource Management: The Choice Is Yours!

PROCEDURES: Move group outdoors for this activity. PRODUCT WARNING: The instructor should be prepared to participate and possibly get wet! (In cold weather, do not use water; fill balloons with air.)

Gather participants in a circle and explain they will each be given a very special gift. This gift has been given to them for their use. They will choose what to do with it. Give each student a balloon filled with water. Take a few minutes for them to hold their balloons, feel it, get used to it. Tell class they have five minutes to leave circle and do whatever they wish with their "gift" and come back to circle. Ask them also to observe what others are doing.

Teacher also notes natural human reactions. Have learners report what they did with their balloons. Instructor reports what was observed.

Discuss: Different ways people use resources. Compare this to the use of petroleum, (what the balloon is made from). Land for landfills (where the wasted balloon will go, maybe), and the use of other resources (where did the string come from?), etc. Questions to use in discussion:

Why is it important for people to think about how they use resources?

What happens if everyone used their resources immediately?

Were there any balloons left?

What did you do with your balloon if it ended up broken?

Did you leave your balloon in nature to harm animals or land?

Are there things we use today that will not be here for your grandchildren?

What are these things? (Clean water? Petroleum?)

Is there a way to make sure we keep these things?

What can we do?

- Refuse to use up
- Use to reuse.
- Recycle to reuse.

Also discuss balloon releasing, which is banned in some areas of Iowa because of the potential danger the broken/discarded balloons cause for animals, birds, water supplies, earth. Helium balloons eventually fall back to earth and can be blown by strong winds miles away. Some sea animals mistake the balloons for jellyfish or food. When an animal tries to eat the balloon, it can kill the animal by blocking the intestinal tract. Warn learners about the dangers of letting balloons fly away, or allowing broken balloons to litter the ground where birds may become entangled or mammals may eat them. (For more information, contact the Balloon Alert Project, 12 Pine Fork Drive, Toms River, NJ 08755; 201-341-9506.)

Pass out another water balloon (air balloon) to each learner. Have them hold their balloons and get to "know" it. Explain how the three parts represent the three resources: balloon- petroleum, water - natural resource, string - natural resource. All three could be reused, two possibly recycled.

Will your choice be different this time?

How?

Why?

Emphasize again, this is a very special gift, given especially to them. Everyone has choices.

What they do is their very own choice. Give them five minutes to do whatever they choose.

Gather back to circle and discuss choices.

*The use of balloons for educational purposes in quite controversial.

A leading Iowa environmentalist once said, "We will always have balloons, how we use them is the critical point."

MY LITTLE BIT: Have learners evaluate their choices in purchasing by signing a contract that states, "I shall always think twice before buying, using, or discarding an item..."

WE CAN MAKE A DIFFERENCE: Have group design and display a large poster that is titled: "The Choice is Ours. We choose ....." Complete the poster with pictures of learners choosing to recycle, refusing to buy, and include student quotes related to choices made that are good for the environment. Have participants sign their names and name of the group or class.

EVALUATION: Participation in the activity and discussion is a large part of evaluation. The written contract can be expanded to serve as measurable evaluation.

EXTENSION: Discuss choices in purchasing. No one makes you purchase certain products. What you purchase, how you use a product, and how you discard it is a much bigger responsibility than the use of a water balloon. Stress: You can be a guardian of our resources.

Have students write an epitaph for their balloon. Design a tombstone and copy the epitaph onto the tombstone.

...an environmentally literate citizenry... and continued environmental education programs, will make it possible to develop new knowledge and skills, values and attitudes, in a drive toward a better quality of environment, and, indeed, toward a higher quality of life for present and future generations...

--William B. Stapp

How Much for the Wrapper?

OBJECTIVE:

The learner will be able to: 1) identify excessive packaging of a variety of items; 2) critically analyze and evaluate the purpose of excessive packaging; and 3) make qualitative judgements of items that use excessive packaging; 4) list advantages and disadvantages of packaging; 5) differentiate between excessive and necessary packaging; 6) classify packaging as biodegradable or non-biodegradable; 7) identify packaging that is recyclable and/or reusable; 8) classify packaging as being constructed from renewable or nonrenewable resources; 9) design a package that reflects awareness of waste reduction and resource conservation.

ACTIVITY IN BRIEF:

The learner will examine photographs and other examples of items they select as examples of excessive packaging and calculate to the best of their ability the dollar and environmental cost.

MATERIALS:

magazines, newspapers, and actual packages, i.e., valentine candy boxes, cereal boxes, single serving items, non-carbonated drink items, items double or triple packaged, items with glossy wrappers

GRADE: 7-9

SUBJECTS: mathematics, language arts, social studies, business education

TIME: Two, 45-minute periods

GROUP SIZE: any size

SKILLS: analysis, classification, djsucssion, evaluation, observation, reading, designing a package

VOCABULARY: recycling, packaging, advertising, renewable, nonrenewable, biodegradable, non-biodegradable.

CONCEPT: II. 1. Many items are excessively packaged. 2. Packaging can be reduced or the individual can refuse to purchase items exessively wrapped. 3. There are numerous ways packaging can be reduced. 4. There is no such place as 'away.'

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How Much for the Wrapper?

PROCEDURES:

1. Ask each participant to find at least one advertisement or actual example from the materials provided of items that are overpackaged. This may consist of double and triple packaging or excessive use of paper, plastic or other disposable materials. Individually packaged items within a larger container, glossy bows, flowery arrangements and other items intended to give eye appeal may be included.

2. Participants will work in small groups (two to four) to examine the item or the advertisement, and determine the following:

    a. What purpose did the manufacturer have for designing the package?
    b. Does the package add value? What kind of value?
    c. Does the design, shape, color, or added features have a direct relationship to the product?
    d. Can the contents of the container be purchased in a different form (i.e., bulk, large size containers, in less elaborate packages)?
    e. If yes, what is the comparative cost of the item in a less excessively packaged form?
    f. Identify and describe ways in which the packaging of the item contributes to excessive waste that may need to be recycled or sent to the landfill.
    g. How does the package affect a retailer—takes up space on shelves, prevents shoplifting.

3. Learner will list packaging criteria and explain reasons why the manufacturer used this means of merchandising the product. From this list learners evaluate whether the packaging was appropriate or inappropriate, stating rationale.

4. Learners will brainstorm ideas of alternative methods the manufacturer could use to reduce the amount of packaging.

5. Learners will compare the cost of their "new" design with that of the present container to establish. How much was spent on the current container?

MY LITTLE BIT: The learner will do a self examination of items he/she or his/her family purchases frequently and examine the quantity of packaging used for the item.

WE CAN MAKE A DIFFERENCE: The group will develop a contract with themselves, reached by group consensus, to avoid purchasing those items they have identified as excessively packaged through these criteria. Letters to manufacturers displaying the signed group contract will be sent to the manufacturer.

A community group may sponsor a contest for designing a package. Read "Away on the Bay" in Pollution Nature Scope p. 60. Nature Scope available from National Wildlife Federation, Washington, D.C..

BACKGROUND: Participants may make a supermarket or department store survey, looking for items that are double or triple wrapped. Items may include cereals, candy, cosmetics, fresh produce, and a host of other products. Post a list of items noted. Compute actual value of the product and the cost of the total product. (Bulk purchase versus small size containers may also prove to be a valuable exercise.)

Participants will need to have working definitions of: excessive and necessary packaging, biodegradable, non-biodegradable, recyclable,

reusable, renewable and non-renewable resources.

Some of the functions and benefits of packing are:

- •preservation and protection of the product
- •sanitation and safety
- •identification of the product
- •theft prevention
- •provision of product use instructions
- •provision of employment for those who manufacture the packaging
- •compliance with regulating standards imposed by federal and state laws
- •increase profits for the company by inducing the consumer to purchase the product due to eye-catching packaging

The disadvantages or drawbacks of packaging are:

- •contribution to waste
- •natural resources are lost if packaging is not reused or recycled
- •adds to litter problem
- •creates false impression about the quantity or quality of the product
- •and increases the cost to the consumer

One out of every eleven dollars spent on goods is for packing. Packaging makes up to 40% of all our solid waste and 95% of all packaging is meant to be thrown away, some even before the product is used.

EVALUATION: Participants will maintain a record of items purchased during the next two weeks and ascertain if their consumption of excessively packaged goods has decreased due to their increased awareness.

Students will demonstrate how they reduced double and triple packaging by refusing unnecessary bags for purchased products.

STUDENT HANDOUTS:

Handout: Name _____

DESIGN A PACKAGE

1. Select a product that you feel needs a package that is better for our environment.

2. When you are designing your package, consider the following:

   product protection

   public safety

   advertising, ingredient, and instruction space

   shipping weight

   cost

   resource conservation

   waste reduction

3. Make a drawing or drawings of your design.

4. Write the manufacturer describing the package. In your letter, include the types of materials used and the size of the package. Also explain how your package is better for the environment than the manufacturer's package.

How Much for the Wrapper?

PACKAGE EVALUATION Name _____

Select ten products and complete the following:

Product	Description of Package	Check appropriate boxes for types of packaging:								
		From a Renewable Resource	From a Non-renewable Resource	Can be Recycled	Can be Recycled Locally	Biodegradable	Not Biodegradable	Package will beReused	Excessive Packaging Present	Necessary Packaging Only

Take Out the Garbage!

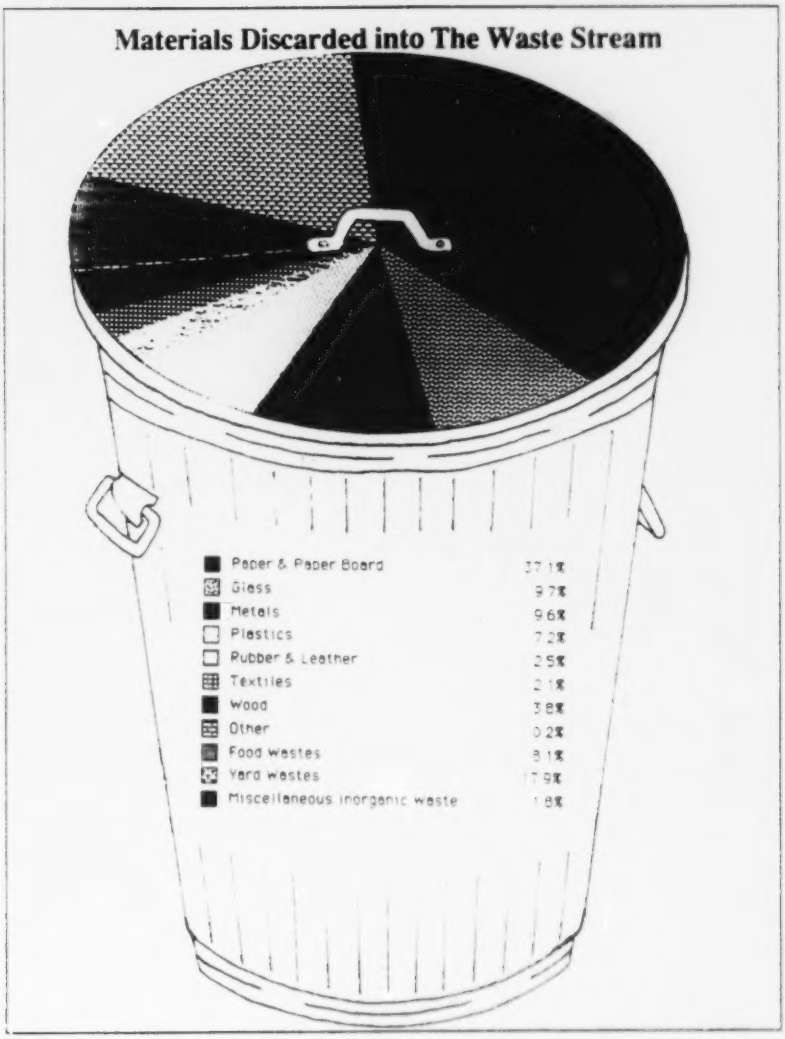
OBJECTIVE:

The learner will be able to list the materials discarded into the waste stream and develop a plan to recycle some of these materials.

ACTIVITY IN BRIEF:

Using a large visual of a garbage can and the percentages (percentage in illustration is by weight) of wastes in the waste stream, learners will categorize their garbage and discuss recycling efforts.

silhouette of garbage can, markers, 11 different colors of construction paper



GRADE: 7-9

SUBJECTS: social studies, language arts, art, home economics, environmental problems

TIME: one class

GROUP SIZE: any

SKILLS: inference, analysis, critical thinking, identification, prediction, listing, graphing

VOCABULARY: garbage, organic, waste stream

CONCEPT: II The waste stream is made up of many kinds of wastes.

Take Out the Garbage!

PROCEDURES: Before the lesson, prepare a large "garbage can" visual (see background) and "graphs" as follows:

- using a large piece of poster board or oak tag, cut out the silhouette of a garbage can and decorate accordingly.
- using a different color (11 total) of construction paper for each, cut out the sections of the pie graph
- label each section with the category and percentage of waste stream as shown in background information
- on back of each graph piece put the name of the "garbage"
- place all eleven pieces of the pie graph face down on the table with only the name showing

Begin lesson with a discussion of "garbage" and its source. Ask participants what used to be in their "garbage" cans at home. Have participants make a list.

Make a classroom list of "garbage" items. Rank order the list from most to least according to how frequently it was mentioned. Discuss why that particular order was selected and why the number one item was so popular (Why is there so much paper waste?)

Display the instructor-made "garbage" can and announce that you will discuss what the average garbage can in Iowa contained. Have participants select the piece of the graph corresponding to their #1 choice and read the percentage. Continue this until all of their choices are selected. Discuss everyone's items that fall into this category. If there are any pieces left, discuss the idea that these things also go into the garbage.

Now introduce recycling and what Iowa is doing, and specifically, what your community recycles and how it is accomplished. (Instructor will need to check county or city solid waste authority for information or assign participant(s) to this task.)

Take each piece of the pie graph out for each recyclable and discuss how much landfill space is saved. Go over the handout "Ten Ways To Reduce" (Solid Waste, that is).

Discussion questions:

- Why is it important to save landfill space?
- How does recycling affect our natural resources?
- Why is it difficult to recycle?
- What can we do to help recycle?
- How can we make it easier for others to recycle?

MY LITTLE BIT: Learners decorate a brown paper bag with a slogan, a picture, part of the pie graph "saved", etc., to take home for recycling aluminum cans. Learners bring in all their aluminum cans, collect, and return to a store. Use the money to fund another earth-healthy activity.

WE CAN MAKE A DIFFERENCE: Make a sign about recycling to save valuable resources. Choose a slogan which will make people want to recycle. Have the group choose the best two or three ideas, make into posters and post in community centers, grocery stores, etc..

EXTENSION: Participants may design and create bags/bins for classroom use throughout

the school or building for recycling. {Participants fill in worksheet.}

Invite guest speakers from County Board of Supervisors and area Solid Waste Commission.

EVALUATION: Discussion and designing of a sign may be used for evaluation. Participation in making posters.

HANDOUTS:

Ten Ways to Reduce (Solid Waste, that is)

1. Buy products that will last. Read and evaluate the warranty.
2. Buy products in recyclable, returnable, or refillable containers.
3. Don't buy items that are disposable such as pens, razors, diapers, etc..
4. Don't buy excessively packaged items.
5. Buy in larger quantities whenever possible as these use less packaging per ounce. Toothpaste is a good example. (Hazardous chemicals are an exception — buy only what you need of these.)
6. Cooperate in recycling projects by separating cans, bottles, newspapers, etc..
7. Buy products packaged in recycled materials.
8. Use less paper. Don't use paper plates, write on on both sides of the paper, use scratch paper for notes.
9. Reuse products. Find another use for items. If you really don't need an item, take it to a garage sale, exchange it, or donate it to charity.
10. Pass on the good news. Influence others to reduce.

Do not try to satisfy your vanity by teaching a great many things. Awaken people's curiosity. It is enough to open minds; do not overload them. Put there just a spark. If there is some good flammable stuff, it will catch fire.

Anatole France

Hold the Package Please

OBJECTIVE:

The learner will be able to identify excess packaging.

ACTIVITY IN BRIEF:

Learners will survey a variety of fast food places to identify excess packaging and identify alternatives to reduce waste.

MATERIALS:

survey form, pen/pencil

GRADE: 9-12

SUBJECTS: home economics, social studies, science, environmental problems

TIME: extended

GROUP SIZE: any

SKILLS: observation, survey, research, critical thinking

VOCABULARY: styrofoam, polystyrene

CONCEPT: II. Refuse excess packaging to reduce waste.

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Hold the Package Please

PROCEDURES: Discuss with learners the types of packaging items used in fast food places.

-What materials are used for packaging (foam, plastic, paper, film, etc.)?
- What are the purposes (keep food warm, easy to stack, identification, transportation, etc.)?
- Are the same types of packaging used in all fast food places?
- What happens to all the packaging after the food is consumed?

Visit a fast food place (or recall from a previous visit if they cannot go) and observe (recall) the types of packaging used for different types of food, and record on chart. Make sure to record types of packaging used inside and types used in the drive-through (outside). (Instructor could bring in packaging from a recent meal if necessary.)

After surveys have been completed for a number of different restaurants and a variety of food items, discuss the following questions:

How many times was the hamburger/ chicken, etc., covered? (wrapping, box, then bag, etc.).

Where do the customers place their "garbage"?

Is any of the "garbage" recyclable?

Do "fast food" places use anything difficult to recycle because it is convenient?

What is the current trend on "fast food" recycling?

What are the alternatives to fast foods and their packaging?

MY LITTLE BIT : Have learners carry their own mugs and cups into fast food restaurants, recycling instead of using polystyrene, cardboard or plastic, thereby practicing waste reduction instead of using disposable products.

SPECIAL NOTE: Restaurants, especially fast food, have standard prices for their own size cups, for fast processing. Learners should be cautioned to be courteous and have reasonable expectations concerning the size of mug they bring in and the cost assigned to refill it. Some outlets may refuse to use customer's container. Address how participants should respond.

WE CAN MAKE A DIFFERENCE: Learners write letters to the managers of the "fast food" restaurants giving them the data collected along with a request for recycling plans and/or suggestions to cut back on excess packaging, or to compliment the management upon efforts to reduce packaging.

EVALUATION: Survey responses and draft letters to restaurant managers can serve as evaluation tools.

EXTENSION: Research packaging techniques and recycling in "fast food" places in other parts of America, Japan, or other countries. Report to class. Take pictures of places where you have observed fast food packaging as litter.

Hold the Package Please

Handout: Name _____

Survey Sheet

Fast food restaurant _____

Inside/Outside (circle one)

Customer	Number of items purchased	Types of packaging (polystyrene, plastic, paper)	Other (napkins, straws)	Carried away in (bags, trays)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
TOTALS				

Conclusions:

What formal education has to do is to produce people who are fit to be inhabitants of the planet ...Otherwise [young people] are going to grow up and discover that we have taught them how to live in a world long gone.

--Kenneth Boulding

Paper Recycling

OBJECTIVE:

The learner will be able to:

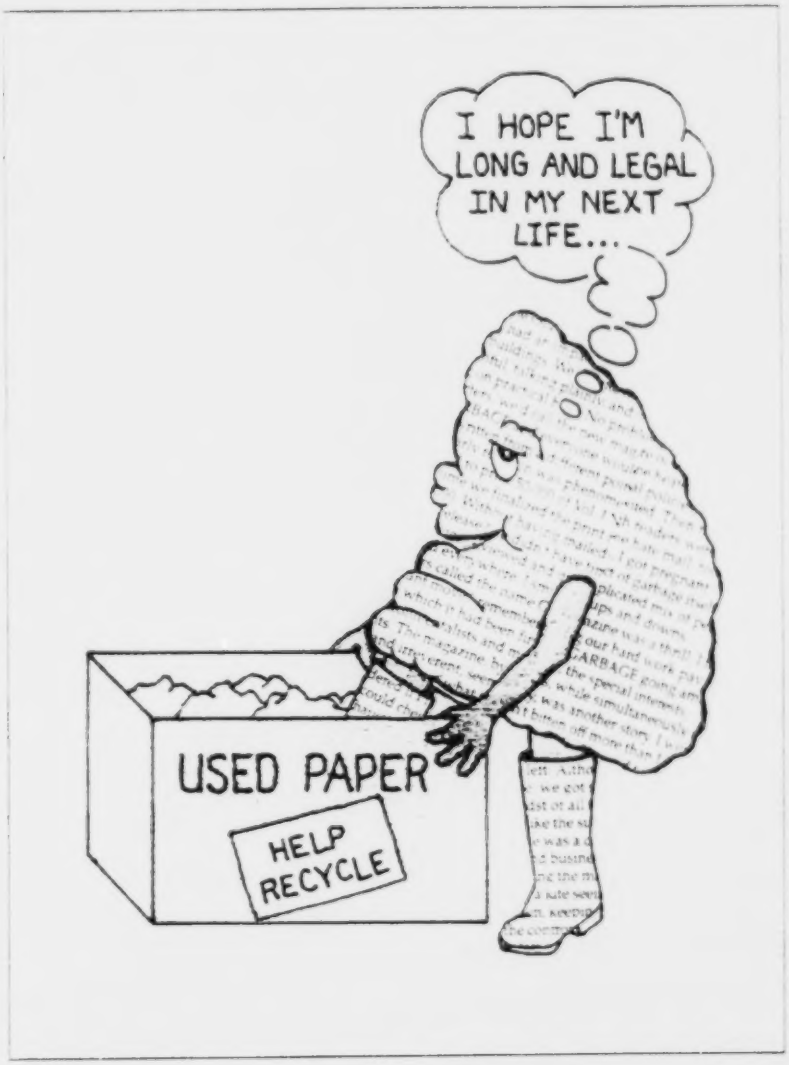
1. Organize and carry out collection of paper for recycling.
2. Explain the importance of reducing paper use.
3. Generate a list of ways to conserve paper use.
4. Make changes in personal living style in order to reduce paper use.

ACTIVITY IN BRIEF:

Learners plan, organize and carry out a paper recycling program and develop other strategies to reduce paper use.

MATERIALS:

boxes, tally sheet



GRADE: 7-12

SUBJECTS: science, social studies, environmental problems

TIME: 75 minutes for organization (minimum) continuing time outside of class.

GROUP SIZE: any size

SKILLS: observation, research, graphing, recording, computation, brainstorming, analysis, evaluation

VOCABULARY: recycle, reuse, renewable, nonrenewable

CONCEPT: II. Waste volume reduction is important to conserve landfill space and protect resources.

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Paper Recycling

1. Hand out the PAPER USE TALLY SHEET. Have participants record a) the paper they use and throw away each day and b) the paper that they used inefficiently. (See BACKGROUND)

   or

   Collect paper for a week. At the end of the week, find the mass of the paper, sort it into two categories (used completely and inefficiently used), and find the mass of each category. Make comparisons.

2. Hold a group discussion about paper use and reasons to conserve on this use. (See BACKGROUND) Generate a list of ways to accomplish this conservation. This can be done as a large group or in smaller cooperative learning groups. The discussion should involve recycling, reuse, and efficient use.

3. As an outgrowth of participant suggestions made in the discussion, investigate the possibilities of a paper collection program for recycling. Brainstorm what steps need to be followed to set up a program. (See BACKGROUND)

4. Once the steps have been generated, set up participant committees to study ways to implement each step.

5. A possible scenario for paper collection, as well as in-building education on the rationale and requirements for collection, could involve participant teams "adopting a room." To initiate this program the following procedure is suggested:
   a) Prepare a large chart with all rooms listed
   b) Have individual sign up for a room
   c) Have individuals generate the responsibilities for room adoption (see BACKGROUND)
   d) Have students record the mass of the paper collected for their adopted room on a large displayed bar graph of mass vs. room
   e) Periodically (weekly or quarterly) have participants determine the total mass collected. Determine a method for calculating approximate volume as a means of figuring space saved in the landfill. (See BACKGROUND) Calculate the mass and volume of paper used per person and staff. Calculate the number of trees saved. (See BACKGROUND)
   f) Have a student committee keep the school informed of the progress of the collection project through posters, in bulletins, or school newspapers.

6. Have participants generate a list of ways other than recycling to conserve paper use. Initiate some of these both individually and as a group. Have participants set up a box for scratch paper in their adopted rooms and also post the generated list.

MY LITTLE BIT: I will use both sides of paper, save paper for scratch use, suggest to others that more efficient paper use is possible, buy recycled paper, and implement a paper conservation program in my home.

WE CAN MAKE A DIFFERENCE: Research the cost of recycled paper through state purchase and present this information to the school board or organization for their consideration. Be sure to include the rationale for conserving paper, (See BACKGROUND) Develop a presentation for area businesses about

program. This might include a student made video, pictures, overheads, graphs of generic as well as local school or organization data.

Help train employees of area businesses to implement and carry out a paper recycling program.

Organize a paper recycling and paper conservation display for a school group or open house. Include rationale, procedures, market, recycled products, include the paper recycling process such as an actual paper making activity. (See activity in elementary section called "From Trees to Paper. It's Slurry Time")

EXTENSION: Make posters, write editorials, do radio and TV service commercials, give presentations to community organizations and businesses about reducing, reusing, and recycling paper.

Create, produce, and present a play about paper recycling and conservation to elementary students, or other groups in the community.

Create and present an award for the best conservation practices.

Develop a list of ways that your school administration office or organization can conserve on paper. Organize and present this information to the appropriate personnel. (See ACTIVITY LIST FOR REDUCING SOLID WASTE)

EVALUATION:

1. List reasons that point out the importance of recycling paper.
2. In a brief essay, describe what you personally are doing to minimize the amount of paper that you are putting into the waste stream.

BACKGROUND: Paper is made from trees, a renewable resource. The production of paper, however, uses a large number of trees, takes a lot of energy which most often is using nonrenewable coal or petroleum resources, and adds pollutants to the air and water. Since trees prevent erosion, provide energy saving shade and wind protection, decrease the greenhouse effect by using carbon dioxide, and provide habitat for wildlife, it is important to our environmental well being to preserve as many trees as possible.

The recycling of paper is also important because not only are we not using as much landfill space, but the recycling process is less harmful to the environment. According to some sources, recycled paper requires 61% less water, produces 70% fewer pollutants, and saves 65% more energy than paper made directly from trees. Americans recycle less than one-third of their paper.

High grade office paper and computer paper can be turned back into computer paper, office paper, and lower grades of paper, so it has a fairly good market. The green bar computer paper is of highest value. Schools generate a lot of paper that falls in the category of high grade office paper. The kinds of paper that can be collected will depend on the buyer that is secured, so you will need to generate your collection list from those parameters. Cardboard does have a market, but needs to be a specific bale size in order to qualify for most buyers. Newspaper has a very limited market. You may or may not find someone who will "take" it. Some newspaper is being used for insulation and animal bedding. If your school or organization is in a rural area, transportation of the paper to the buyer becomes a major problem and a consortium of communities may need to work out a solution to the problem. Of course, if you have a recycling program in your community, the implementation of a school or group recycling program becomes a much less complicated task.

Paper Recycling

Participants will need to decide the criteria for inefficient use. Questions that might be considered are: Could both sides be used? Could the information have been presented just as effectively in another way? Does the hand-out adapt itself to being reused by other groups or in other years? Could the information have been presented on a smaller piece of paper or condensed to save pages?

Adopting a room is just one way of organizing a paper collection for recycling in your school. There are many other options which might involve organization by administrators, by student council or other organizations, or by members of the community. "Adopt a Room" is an option that might be used as a class project. For further information about setting up such a program see Designing A Rethink Classroom using th 3-R's in the elementary section; and A-WAY With Waste, Washington State Department of Ecology, 4350-150th Ave. NE, Redmond, Washgton 98052 - An Action Booklet for Recycling in the Classroom and School.

The participants will need to generate ideas about what steps they need to follow to set up this paper recycling program. Ideas might include:

(1) Check to see if there is a recycling center, organization, or company that will take the paper saved.
(2) Find out what kind of paper can be marketed.
(3) Obtain permission and suggestions from the administration.
(4) Locate a storage center in the school.
(5) Gain the cooperation of the staff and students.
(6) Plan how paper will be collected and removed.
(7) Determine who will be utilized as workers and how they will be used.
(8) Educate the staff and student body about paper recycling.
(9) Determine the extent of the program (one school, whole district, etc.) A small start is advisable.

Participants should agree on the responsibilities for room adoption. Suggestions might be:

(1) Obtain, design, and decorate the collection box. (Help might be obtained from shop and/or art classes.)
(2) Make a poster listing the kinds of paper which can be recycled and post it in the adopted room.
(3) Make a brief presentation to students and or staff about the rationale and criteria for this project.
(4) Check periodically for use.
(5) Weigh and empty the paper in the storage area.
(6) Return the box and keep the room informed about their progress.

Participants will be able to determine how to calculate volume. One way is to crate a cubic foot of paper and find the mass of that cubic foot. Divide this value into the total mass to determine the total cubic feet. This will only be approximate, since not all kinds of paper have the same density.

A stack of paper three feet tall, three feet long and three feet wide (one cubic yard or meter) uses approximately one "average" size tree. An estimate might be determined about the number of trees used by calculating the total volume of paper. Students may want to research this problem and come up with more precise figures and methods.

Handout:
Name 116

Handout: Name _____

Paper use tally sheet.

Worksheet

PAPER USE TALLY SHEET		
	Number of sheets used and thrown away	**Number of sheets used inefficiently**
Mon		
Tues		
Wed		
Thurs		
Fri		

Reverence for Life

Let a man once begin to think about the mystery of his life and the links which connect him with the life that fills the world, and he cannot but bring to bear upon his own life and all other life that comes within his reach the principle of reverence for life...

Albert Schweitzer

OBJECTIVE:

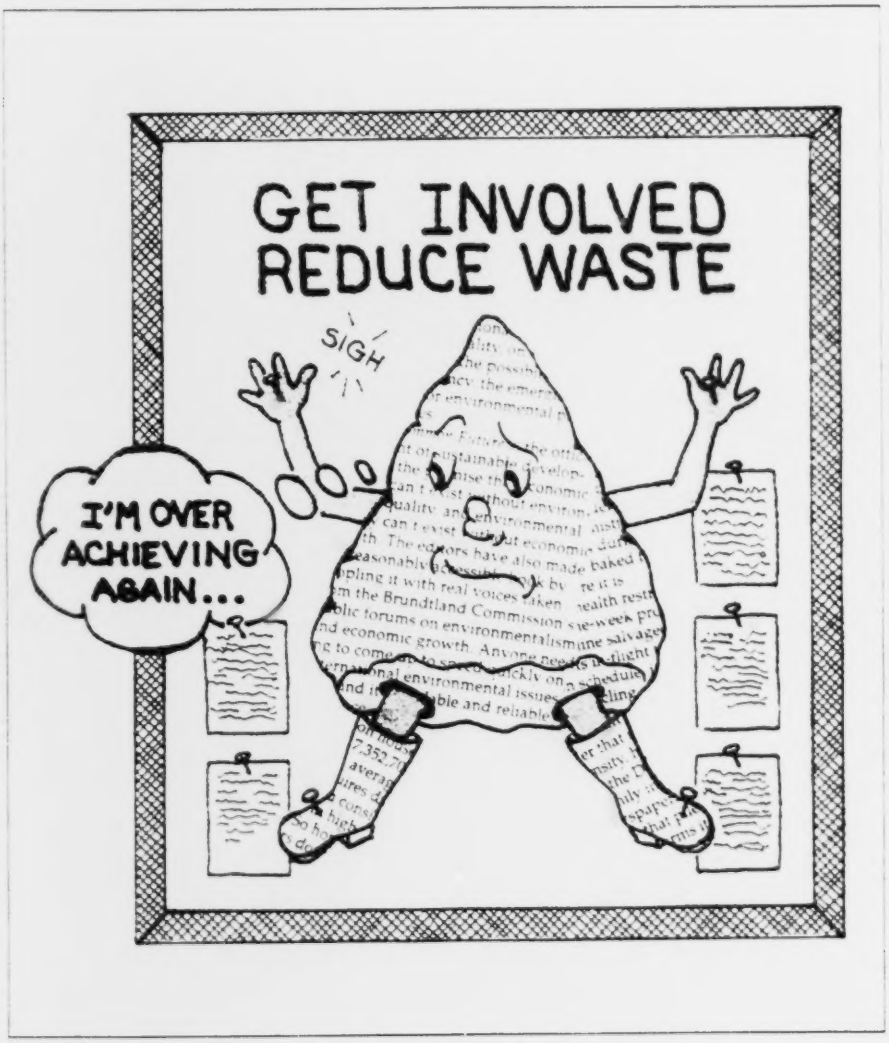
The learner will be able to define lifestyle habits they currently practice and evaluate them for expansion to lower solid waste volume.

ACTIVITY IN BRIEF:

Participants will create a large display for state fair, local fair, parent teacher conferences that list things that could be done in their community to reduce solid waste volume.

MATERIALS:

stencils, colored paper, markers, paints, glue, scraps of paper, recycled materials, scissors, materials to make a large display



GRADE: 9-12

SUBJECTS: social studies, language arts, environmental problems, art, Spanish

TIME: 200 minutes

GROUP SIZE: class size

SKILLS: visualization, creation, identification, research, analysis, synthesis, manipulation, collaboration

VOCABULARY: lifestyle habits, solid waste, reduce, reuse, recycle.

CONCEPT: II. Waste volume reduction can be accomplished by each person and solutions may require lifestyle changes.

Expanding Habits

PROCEDURES: Many people believe that recycling involves a major lifestyle change for many people. It is true that to solve the solid waste problem in this state, all people must become involved. The average person produces four pounds of waste each day. Solid waste is defined as all solid and semi-solid wastes, including trash, garbage, yard waste, ashes, industrial waste, small demolition and demolition and construction waste and household discards such as appliances, furniture, and equipment.

To minimize the solid waste problem all Iowans need to refuse, reuse, and recycle solid wastes and products that contain wastes.

Refusing decreases the volume of solid waste by not allowing it to enter the waste stream. Not buying an item that is overpackaged, keeps that excess packaging from getting in your trash.

To reuse means to extend the life of an item by using it again, repairing it, modifying it or creating new uses for it. Waste volume is again reduced because the item does not enter the waste stream.

Recycling is the collection and reprocessing of manufactured materials for reuse either in the same form or as part of a different product. Recycling also keeps items from reaching the waste stream, thus reducing volume of solid waste.

A lifestyle change infers that new habits would need to be learned. This can be threatening to some people. Propose to your students that this change may be easier than they imagine. It may only need an "expansion" of their current habits.

Place participants in groups of 4-6, and brainstorm ways in which they already Refuse, Reuse, and Recycle. List these ideas for all to see. (A partial list is included in this activity.)

Reinforce these habits participants already have and emphasize the need to expand these habits to decrease the volume of solid wastes. Since they already know how, and they're already doing some reducing, reusing, and recycling, then expansion should be easy!

Now brainstorm ways in which learners can expand their refuse, reuse, and recycle habits. Again, write a list for all to see. Lead discussion into the ease and feasibility of the solutions.

Finally, have learners design a large three-dimensional mural or display for parent-teacher conferences, or ballgame, a schoolboard meeting, a fair or public event that provides the message: "Reducing solid waste may be easier than you think!" (An example of a possible sketch, note cartoon on the preceeding page.)

GUIDELINES FOR THE DISPLAY:

1) Make sure to use as much recycled material as possible in the display. (Borrow 2x4's and lumber from a local lumber yard or your local school Industrial Technology department to be returned and reused later.) Fabric background could be borrowed from a fabric shop, home economics or drama departments from local schools. Print on recycled paper.

2) Use as much space as possible — spread out the display so it is not cluttered and hard to read. This would allow viewers to walk freely between sections and take their time to think.

3) Use eye-catching colors and ideas. Words can be formed by placing recyclable aluminum cans in formation. 3-D effect can be created by the use of recycled foam products. Use discarded paints.

4) Provide handouts and notes with specific facts involving solid waste and the need to reduce solid waste volume.

5) Provide specific information on what people can do in your community. What to recycle, what is being collected, and where. Who to write to, what to say, etc..

MY LITTLE BIT: Each learner will invite at least five people to view the display and ask them to personally help reduce solid waste.

WE CAN MAKE A DIFFERENCE: Each learner should design/create a part of the display, involving researching and stating facts.

EXTENSION: Participants may write up the experience and display to print in the local paper. Participants may video tape their display for a public service announcement and/or commercial. Participants will write requests to the school board, activity boosters, or other community organizations to request action leading to the reduction of waste (i.e., stop using disposable cups at meetings).

EVALUATION: Evaluation based upon group participation, research and evaluation in developing and constructing the display. Participants will write a statement about what they learned from the experience.

BACKGROUND: The following lists are posibilities that may or may not apply for your community. It is a partial list to stimulate ideas.

WHAT WE ARE DOING NOW...

REFUSE:

Refuse fast foods served in foam containers.
Refuse to buy own newspaper (read one at work).
Refuse to buy current fad items, only to discard later.
Refuse paper/foam plates, use and wash own.
Refuse facial tissue, use cloth handkerchief.

REUSE:

Share newspaper with peers.
Share books and magazines with friends.
Use cassette and video tapes over and over insted of buying new.
Loan prom dresses to friends.
Print/use both sides of paper.
Buy pop in refillable glass bottles.

RECYCLE:

Rip up old clothes to use as cleaning rags.
Alter clothes to give to younger siblings.
Return beverage bottles/cans for money.

WHAT WE NEED TO DO NOW!

REFUSE:

Refuse the paper/plastic grocery bag -- bring your own!
Refuse disposable diapers - use cloth!

Stop using paper plates, start washing your own.
Stop using and discarding facial tissue, use a cloth handkerchief.

REUSE:

Keep and reuse all bags from shopping for your next shopping trip.
Keep a tall glass in your vehicle to refill with soft drinks.
Wash baggies, reuse bread bags and ties.

RECYCLE:

Turn in ALL aluminum cans.
Collect and return glass containers.

The solution to the environmental crisis... rests neither with scientists nor with government officials, but with a citizenry educated in environmental problem solving.

--Donald Hawkins

-- Dennis Vinton

OBJECTIVE:

The learner will be able to determine the total cost of an item over its lifetime expected use.

ACTIVITY IN BRIEF:

Participants will calculate the comparative costs of size AA batteries which are commonly used items in the household. Participants will then compare the actual lifetime costs versus the initial costs to compare the "best" buy. Extensions will relate this result to the savings in materials, energy and landfill space.

MATERIALS:

life cycle cost worksheet

GRADE: 7-12

SUBJECTS: math, science, industrial technology, environmental problems

TIME: 30 minutes

GROUP SIZE: any size

SKILLS: knowledge, comprehension, application, analysis, synthesis, evaluation

VOCABULARY: life cycle cost

CONCEPT: II. The generation of waste materials may often be attributed to lack of insight of life cycle cost.

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Life Cycle Cost

PROCEDURES: Participants are first introduced to the concept of life cycle costing. To better understand this, participants will complete a worksheet that leads them through the process of calculating this value. Costs for the items would include: cost of energy used, length of service life, initial cost of item to the consumer (the student).

MY LITTLE BIT: Participants will discover that the "Best Buy" is usually the best buy; inexpensive at the sale price often becomes the most expensive in the long term.

WE CAN MAKE A DIFFERENCE: Participants find that, through life cycle costing, they can have an impact on the amount of materials used and discarded. An item that lasts longer may be more expensive initially, but is less expensive in the lifetime of the item. By buying less items means less materials in the waste stream. In many cases, such as batteries, there are also fewer items in the toxic waste stream.

EXTENSION:

1. Obtain appliance efficiency sheets or permit participants to visit an appliance store and compare the energy efficiency labels on "white" appliances to discover the lifetime costs of: stoves, refrigerators, freezers, dryers, etc.

2. Survey people in the community or at school and establish what criteria individuals use when deciding/selecting consumeable items to be purchased.

3. A major item for consideration is the initial cost of an automobile, miles per gallon, and anticipated cost of gasoline required to drive the vehicle during its life expectancy.

EVALUATION: Check for correct math application and understanding of concept.

BACKGROUND: Instructor will need to understand the concept of life cycle costing. Basically, the idea is to calculate the entire cost of an item by using the initial cost, expected lifetime, and cost of energy used during the item's life-span. This is a concept not well understood by the public and not used in determining the overall cost of an item. All these factors, including cost of production, natural resources, and disposal cost are important when also looking at the impact upon the environment.

HANDOUT: Disposable versus rechargeable batteries - activity worksheet.

Service Life for the following:

AA Alkaline

Rechargeable	**Disposable**
4 hrs. per charge - service life worth up to 1,000 charges	9 hrs. service life
original cost $5.95	original cost $1.40
cost of charger $13.95 divided by 4000	total cost $1.40 divided by 9
.005/hr	**.16/hr**

Nominal electric power.

ENERGY TECHNOLOGY
LIFECYCLE COSTING

Service life for the following appliances:

Freezer	20 year service life
Refrigerator	15 year service life
Gas Range	13 year service life
Electric Range	12 year service life
Dishwasher	11 year service life
Clothes Washer	11 year service life
Electric Dryer	14 year service life
Gas Dryer	13 year service life

Directions: Please answer the following questions in the spaces provided.

1) What factors must be considered when calculating lifecycle costs?

2) You are comparing two electric ranges to purchase. Range A costs $624 and uses 40 KWH per month. Range B costs $407 and uses 69 KWH per month. Calculate the lifecycle costs for each and determine the best buy.

3) Refrigerator A costs $919 and uses 587 KWH per month. Refrigerator B costs $1700 and uses 152 KWH per month. Calculate lifetime costs for both appliances and determine the best buy.

4) Electric waterheater A costs $198 and uses 3240 KWH per month to operate. It has a service life of 15 years. Electric waterheater B costs $577 and uses 1200 KWH per month. It has a service life of 15 years. Calculate lifetime costs and determine the best buy.

We can all continue to say we are only churchmen, or only educators, or only students, or only government people -- that our role is limited, and that we cannot be expected to solve the problems of the world. But... some of us had better choose to define ourselves as world problem solvers if world problems are going to be solved.

--Robert Theobald

I Can I.D. Can You?

OBJECTIVE:

The learner will be able to tell the differences between aluminum, tinned and bimetal cans.

ACTIVITY IN BRIEF:

Participants will compare/ contrast beverage cans for composition.

MATERIALS:

samples of aluminum, tinned, steel, bimetal containers

GRADE: 7-12

SUBJECTS: science, environmental problems

TIME: 45 minutes

GROUP SIZE: any

SKILLS: manipulation, observation, comparison, identification, classification

VOCABULARY: recycling, bimetal, magnetism, alloy

CONCEPT: III. Source separation at the household level accommodates recycling.

I Can I.D. Can You?

PROCEDURES: Discuss ways in which waste is reduced by recycling. Tell participants that cans are recyclable, but that some are much easier to recycle than others.

Hold up samples of the three major types of cans: aluminum (i.e., soda cans), tinned — these are really 99 percent steel with a thin coating of tin (i.e., soup cans), and bimetal (i.e., often tuna fish cans, small apple juice cans, and tennis ball cans are bimetal).

Explain that bimetal cans are cans that have an aluminum top and a steel body. Bimetal does not refer to a can that has two metals combined to form an alloy.

Note that at first glance, these cans are very similar in appearance, but that it is important to tell the difference because the bimetals are not easily recyclable, and we should therefore avoid buying these when possible. It is also important to be able to identify the type of can because different types need to be separated before being recycled.

Use the following methods to determine the differences between the metal cans:

1) Magnetism
   Hold up a magnet. Ask for a show of hands of those who have experimented with magnets. Did they notice the things that magnets will attract? Explain that magnets are pieces of iron or steel that can attract iron or steel. (This property may be naturally present or artificially induced.) Experiment with objects to show some of the metals the magnet will attract and others that are not attracted.

   Demonstrate that magnets attract tinned and parts of bimetal cans but not aluminum cans.

2) Appearance
   Pass out samples. Ask class to point out the differences they see between the cans (i.e., weight, seams, color, shininess). Tell the students that bimetal cans look almost identical to aluminum cans. It is best to compare cans at the same time to see some of these differences. (NOTE: some soda cans may be bimetal.)

Set up a station in the room so that one person or a group can practice separating cans using magnets and observation. You may want to provide a magnifying glass.

Have participants bring in clean cans and separate them into three groups.

Calculate the amount of cans an average family produces as waste in one week. Make a graph showing the amounts in aluminum, tinned, and bimetal.

Make some generalizations concerning use and disposal of cans used.

Think about and talk over with the group the amounts/kinds of cans used by institutions. Restaurants, and institutions which prepare large quantities of food, such as hospitals, schools, and care facilities, often receive food in large cans, which, when empty, occupy space in garbage dumpsters. Politely inquire as to their costs for garbage pick-up and ask them to estimate the quantity of cans used weekly. Help calculate any potential savings from recycling (i.e., smaller dumpster rented, fewer pick-ups). Remember that resistance to recycling comes from the difficulty of behavior change - offer to assist with training of staff.

MY LITTLE BIT: All learners bring in cans to be recycled, continuing to recycle all cans used by the family.

WE CAN MAKE A DIFFERENCE: Construct a machine to flatten bimetal and tinned cans and send the collected cans to be recycled.

EXTENSION: Research and discuss how energy and pollution are reduced by recycling metals.

EVALUATION: Have participants fill out the handout.

Handouts:

Name _____

We Can Recycle

Three types of cans:

top made from _____

body made from _____

Magnets will attract _____ and _____

but not _____ cans.

Results of Observation:

	Weight	Seams	Color	Shininess	Other

We Can Recycle! - Cont.

I learned that _____

_____

_____

I was pleased that _____

_____

_____

I was displeased that _____

_____

_____

I realized that _____

_____

_____

I will change _____

_____

_____

Making A Better Landfill?

OBJECTIVE:

The learner will be able to (1) Use a model of a landfill to determine how groundwater could be contaminated, how clay protects a landfill from leaking, how the process of biodegrading is slowed in an enclosed landfill cell; (2) Determine that all landfills must be monitored; (3) Select alternatives to landfilling.

ACTIVITY IN BRIEF:

Participants will work in groups establishing models for different stages in the development of the landfill. Upon completion, each group will report their results. Participants will also research their own landfill.

MATERIALS:

shoe boxes, sand, clay, 1/4 cup water, food coloring

GRADE: 9-12

SUBJECTS: earth science, geology, environmental problems

TIME: 45 minutes (models) 45 minutes (landfill research)

GROUP SIZE: any size. If small, form 3 groups; if large, form 6 groups.

SKILLS: observation, critical thinking, manipulation, prediction, description, recording, analysis, evaluation

VOCABULARY: leachate, permeable, porous, aquifer, impermeable, surficial, aquifer, toxic, stratigraphy

CONCEPT: III. The design of a landfill is critical to protect the groundwater supply.

Making A Better Landfill?

PROCEDURES:

1. Set up the needed materials. If group is large, two sets of materials will be required. If group is small, provide materials for one each of Group A, B, and C. See the worksheet for the materials needed for each group.

2. Hand out copies of the worksheets to the designated groups. Each group will do only one worksheet.

3. Allow the groups to collect the necessary materials and to do the group activity.

4. Using the models, have groups report on the results of their experiment and the answers to their questions.

5. When all groups are finished, have them clean up their materials in the following manner. Take only the contaminated sand out of the shoe box and put it in the bucket labeled contaminated sand. Put the dry sand in the bucket labeled clean sand. Throw the clay and paper towel away. The clean sand can be used for the next group, the contaminated sand can be washed with water and drained until the water is clear.

6. Have participants contact the landfill to find out where they can obtain the following information about their local landfill:

   geology
   daily or yearly amount buried
   life expectancy
   number and results of monitoring wells
   measures being used to reduce landfilling

7. Take the participants on a field trip to the landfill.

8. Discuss ways that participants can cut down on their trash.

MY LITTLE BIT: I will cut back on items that I send to the landfill by buying fewer throw away items, recycling, buying items that last longer, and/or finding a reuse for throw away items.

WE CAN MAKE A DIFFERENCE: Develop a campaign for the school, organization, and for community to reduce the volume of waste going to the landfill using posters, letters to the editor, service commercials, talks to organizations, clubs and other service groups.

EXTENSION: Obtain a map of the geology of the area and try to find another suitable location for a landfill.

Organize a recycling program, if your community does not already have one.

EVALUATION:

1. Write a brief essay describing proper landfill construction and the problems that might result from landfills.

2. Tell at least one way that you plan to cut back on your trash.

BACKGROUND:

When we throw away something, it usually goes to a landfill. A sanitary landfill is a site where solid waste is disposed of on land without creating public health or safety hazards, by confining refuse to the smallest practical area, reducing it to the smallest practical volume, and covering it with a layer of earth at the end of each day's operation or more frequently if necessary.

There are currently about 87 permitted landfill

sites in Iowa. They must be constructed in areas where the possibility of contamination of groundwater will be minimal, with a series of pipes for monitoring laid below a clay liner. Garbage must be compacted and covered with six inches of soil daily, and land must be reclaimed as landfill operations are completed. Most are located in clay rich glacial soil. There are many landfills, constructed before state guidelines, that do not meet all the present day standards.

The 1987 Iowa Groundwater Protection Act mandated some major changes for landfills, including better groundwater monitoring, a plan for landfill alternatives, and higher landfill fees to help pay for these charges. The amount of material disposed of in landfills must be reduced by 25% by 1994, and 50% by 2000 using waste reduction and recycling.

Solid waste alternatives in order of importance are:

1. Volume reduction at the source. Reducing the amount of waste before it goes to a landfill.
2. Recycling/reuse
3. Incineration with energy recovery
4. Incineration for volume reduction
5. Sanitary landfills

Other measures established in the legislation included prohibiting landfill disposal of yard waste, lead acid batteries, whole tires, and waste oil. Still being studied are the disposal of plastic foam packaging and nonbiodegradable grocery and trash bags.

Studies of landfills, have indicated that the process of biodegrading is slowed down considerably in a sanitary landfill. The organisms responsible for breaking down the garbage need water and oxygen to survive. A sealed cell of a landfill does not readily supply these needs.

Handouts:

Group A
Group B
Group C

worksheet

Making A Better Landfill

Name_____

_____

GROUP A

MATERIALS:

plastic shoe box or similar clear container
sand to fill half the box
a small piece of paper towel soaked in food coloring
a container equivalent to one-fourth cup
water
block or other object to raise end of box to about a 30 degree angle

PROCEDURE

1. Fill the shoe box half full of sand.
2. Make a hole in the top center of the sand about the size of the one-fourth cup container.
3. Place the paper towel that has been soaked in food coloring in the hole.
4. Put sand in the hole to just cover the paper towel. Do not fill the hole with sand.
5. Raise one end of the box about 30 degrees.
6. Answer the following questions.

QUESTIONS:

1. Predict what will happen if you pour one-fourth cup of water into the hole with the paper towel.

   _____

   _____

   _____

2. The hole with the paper towel represents a landfill. The paper towel is the daily load of garbage that must be covered with dirt at the end of each day. Slowly pour the one-fourth cup of water over your "landfill". Describe what happens.

   _____

   _____

3. Any liquid leaking from the landfill is called leachate. Is the leachate colorless like the water or is it the color of the paper towel?_____

   _____

The food coloring in the paper towel represents hazardous materials that might leak out of a landfill. What are some toxic substances that might be put in the garbage and taken to a landfill? _____

_____

_____

You poured water in your landfill. How, in nature, might water get into a landfill? _____

_____

4. Predict what will happen if you pour one-fourth cup of water over your "landfill". _____

_____

_____

Now slowly pour the one-fourth cup of water over the landfill. Was your prediction correct? ____

You probably predicted that more colored leachate would leak into the sand and travel toward the lower end of the box. In nature what existing conditions might cause the leachate to travel in another direction? (Tilt remains the same.) _____

_____

_____

_____

5. The leachate travels easily through the sand because it is permeable (it has interconnected spaces that allow liquid to run through it). Suppose that the bottom of the box is an impermeable layer of rock. Imagine also that there is a layer of rock with spaces containing water beneath this impermeable layer (bottom of box). This rock is porous because it has spaces to hold water and if it is a large enough body of rock it becomes an aquifer. In Iowa, about four-fifths of our drinking water comes from aquifers. Do you think that the leachate from your landfill will get down into the aquifer that contains your drinking water? _____

What conditions might exist in nature that would allow the leachate from the landfill to contaminate the aquifer?

_____

_____

_____

_____

6. Suppose that you live on a farm and you got your water from a well that had been drilled into a surficial aquifer. Surficial aquifers are bodies of sand and gravel that contain water. These

are usually close to the surface since the sand was probably deposited by an ancient river or glacier. Where in your model would you drill your well to be sure that your water was not contaminated with leachate from your landfill? _____

7. In nature, landfills are not enclosed in clear plastic. You cannot see if there is leachate or where it is going underground. If you operated a real landfill, how would you check to see if your landfill was leaking or not, so you could assure the neighbors that their water was safe?

_____

_____

_____

8. By law, landfills must have a series of monitoring wells drilled in many areas around them. The water samples from these must be systematically checked. These checks must continue even after the landfill is full and no longer being used. If you had a system of monitoring wells around your model landfill, what would they show?

_____

_____

_____

9. Is your model landfill very safe? What should have been done to make this a better landfill?

_____

_____

_____

_____

10. Was your landfill built in the right kind of geological area? What kind of stratigraphy (layers of earth and rock) do you think a geologist would need to find in order to recommend the construction of a landfill?

_____

_____

_____

_____

_____

worksheet

Making a Better Landfill

Name _____

_____

GROUP B

MATERIALS:

plastic shoe box or similar clear container
sand to fill half the box
a small piece of paper towel soaked in food coloring
a container equivalent to one-fourth cup
clay
water
block or other object to raise end of box to about a 30 degree angle

PROCEDURE

1. Fill the shoe box half full of sand.
2. Flatten out a piece of clay big enough to wrap around the outside of the one-fourth cup container.
3. Shape the clay around the one-fourth cup container leaving the top open. Pinch off even with the top of the cup.
4. Make a hole in the top center of the sand about the size of the one-fourth cup container.
5. Carefully remove the clay from around the cup, retaining its shape, and place it in the hole in the sand.
6. Place the paper towel that has been soaked in food coloring in the clay container.
7. Put sand in the hole to just cover the paper towel.
8. Answer the following questions.

QUESTIONS:

1. Predict what will happen if you pour one-fourth cup of water into the hole with the paper towel.

_____

_____

_____

Making A Better Landfill?

2. The clay liner in the hole represents the landfill. The paper towel is the daily load of garbage that must be covered with dirt at the end of each day. Slowly pour the one-fourth cup of water over your "landfill". Describe what happens.

3. If you poured the water carefully and you didn't put too much sand over your "garbage", the water probably just filled the landfill. Clay is impermeable, that is, it does not have the interconnected spaces that would allow water to flow through it. Sanitary landfills in Iowa must be built over a clay layer. Some landfills are even lined with plastic. If you had no leaks in the clay liner you probably have no water escaping. If you did have some liquid spreading into the sand, you have some liquid leaking from the landfill. This is called leachate. What color is the leachate or if you don't have any, what color is the water in your landfill?

The food coloring in the paper towel represents hazardous materials that might leak out of a landfill. What are some toxic substances that might be put in the garbage and taken to a landfill?

4. The food coloring in the paper towel represents hazardous materials that might leak out of a landfill. What are some toxic substances that might be put in the garbage and taken to the landfill?

You poured water over your landfill. How, in nature, might water get into a landfill?

5. Predict what will happen if you pour another one-fourth cup of water over your "landfill".

Carefully pour just enough water over your landfill to make it overflow. Describe what happens. _____

_____

Although state specifications for sanitary landfills say they must be built over a clay liner, they are covered with dirt at night. This does not have to be clay and therefore can allow liquid to run through it because it is permeable. How in nature might leachate escape in such a situation?

_____

_____

_____

In reality each section of a landfill or cell, is built over a wide area of clay so that any spill over of leachate would probably be stopped by the clay liner. In your model "landfill" you have just one cell, but usually there will be many cells over one clay layer. This clay layer is one of the many soil and rock layers that make up the geology of the area. In order to build a landfill, a geologic study must be completed. Just one of the criterion that has to be fulfilled is the stratigraphy (layers of soil and rock) must contain the clay layer. If you were to represent this in your model, you would have a layer of clay across the whole shoe box.

6. Predict what would happen if you put a hole in the clay liner of your landfill.

_____

_____

Carefully poke a hole with your pencil into the clay liner. Was your prediction correct?_____

The leachate travels easily through the sand because the sand is permeable. Suppose that the bottom of the box is an impermeable layer of rock. Imagine also that there is a layer of rock with spaces containing water beneath this impermeable layer (bottom of box). This rock is porous because it has spaces to hold water and if it is a large enough body of rock it becomes an aquifer. In Iowa about four-fifths of our drinking water comes from aquifers. Do you think that the leachate from your landfill will get down into the aquifer that contains your drinking water?

_____

What conditions might exist in nature that would allow the leachate from the landfill to contaminate the aquifer?

_____

7. If there are many farms around the landfill who get their drinking water from wells drilled into surficial aquifers (bodies of sand and gravel deposited by ancient rivers or glaciers which now contain water), what is the location of the farm that probably has the well water that will not be contaminated by leachate?

8. In a real landfill, it is not possible to see if leachate is leaking from the landfill. If it is, it is not always possible to predict where it will go. What are some factors that might cause leachate to travel little expected paths?

9. If you operated a landfill how would you check to see if your landfill were leaking or not?

Your model "landfill" had a clay liner that should prevent leachate from entering the water supplies. Do you think that this system is trustworthy enough that no testing is needed either now or in the future? Why or why not?

Making A Better Landfill?

By law, landfills must have a series of monitoring wells drilled in many areas around them. The water sample from these must systematically be checked.

10. Is your landfill very safe? What could be done to make it a better landfill?

_____

_____

_____

_____

worksheet

Making A Better Landfill

Name _____

_____

GROUP C

MATERIALS:

plastic shoe box or similar clear container
sand to fill half the box
a small piece of paper towel soaked in food coloring
a container equivalent to one-fourth cup
clay
water
block or other object to raise end of box to about a 30 degree angle

PROCEDURE

1. Fill the shoe box half full of sand.
2. Flatten out a piece of clay big enough to wrap around the outside of the one-fourth cup container.
3. Shape the clay around the one-fourth cup container leaving the top open. Pinch off even with the top of the cup.
4. Make a hole in the top center of the sand about the size of the one-fourth cup container.
5. Carefully remove the clay from around the cup, retaining its shape, and place it in the hole in the sand.
6. Place the paper towel that has been soaked in food coloring in the clay container.
7. Put sand in the hole to just cover the paper towel. Do not fill with sand.
8. Pour about one-eighth cup of water into the clay container with the paper towel and sand.
9. Flatten out a piece of clay to fit over the top of the clay container in the sand. Pinch the sand edges together so that it is completely sealed.
10. Answer the following questions.

QUESTIONS:

1. Examine the sand around the clay container. Describe it.

_____

Predict what will happen if you pour one-fourth cup of water over the sealed clay container.

_____

2. This sealed clay container represents the closed cell of a landfill. The paper towel is the daily load of garbage that must be covered with dirt at the end of each day. Garbage is dumped and daily covered in a given area of a landfill. Water can enter the top of the landfill in the form of precipitation since the soil cover is permeable (has interconnected spaces to allow water to run through). Once the area is full, the area is covered with clay. Slowly pour the one-fourth cup of water over the closed cell of your "landfill". Describe what happens.

3. If you had no holes in the clay, the sand around the landfill should get wet because the clear water runs off over it. Colored water does not escape from the landfill nor does the clear water enter the landfill because the clay is impermeable (it does not have interconnected spaces to allow water to run through it). What do you think will happen to the garbage once it is sealed in the cell of the landfill?

As long as organisms, air, and water can get into the cell before it is sealed, the garbage will biodegrade (be broken down by the many organisms living there). However, once the cell is sealed, the organisms cannot survive as water and air is depleted and the process of biodegrading slows down. With this in mind, would you continue to bury all kinds of garbage here? Keep in mind that the amount of materials disposed of in landfills in Iowa must be reduced 25% by 1994 and 50% by 2000.

Making A Better Landfill?

4. In reality, each section of a landfill or cell, is built over a wide area of clay. In your model "landfill" you have just one cell, but usually there will be many cells over one clay layer. This clay layer is one of the many soil and rock layers that make up the geology of the area. In order to build a landfill, a geologic study must be done. Just one of the criterion that has to be fulfilled is the stratigraphy (layers of soil and rock) must contain the clay layer. If you were to represent this in your model, you would have a layer of clay across the whole shoe box. Since this is a natural layer of material deposited by ancient geologic processes, it could contain flaws which might allow leaks. Predict what will happen if you put a hole in your model "landfill".

Carefully put a hole in the side of the landfill with your pencil. Describe what happens.

5. The material escaping from the landfill is called leachate. This is no longer clear but contaminated with the materials from the garbage, some of which might be hazardous. What kinds of things might be buried in landfills that could be hazardous and might be dissolved in the escaping leachate.

6. The leachate travels readily through the sand because it is permeable (has interconnected openings that allows for the passage of liquids). Do you think the underground water supplies (aquifers) in the area might be at risk of being contaminated? Explain.

7. Imagine that the bottom of the box is an impermeable layer of rock. Imagine also that there is a layer of rock with spaces containing water beneath this impermeable layer (bottom of the box). This rock is porous because it has spaces to hold water and if it is a large enough body of rock it becomes an aquifer. In Iowa about four-fifths of our drinking water comes from aquifers. Do you think that the leachate from your landfill will get down into the aquifer that contains your drinking water?

   What conditions might exist in nature that would allow the leachate from the landfill to contaminate the aquifer?

8. If there are many farms around the landfill who get their drinking water from wells drilled into surficial aquifers (bodies of sand and gravel deposited by ancient rivers or glaciers which now contain water), what is the location of the farm which probably has the well water that will not be contaminated by leachate?

9. In a real landfill, it is not possible to see if leachate is leaking from the landfill. If it is, it is not always possible to predict where it will go. If you operated a real landfill, how would you check to see if your landfill were leaking or not?

Making A Better Landfill?

By law, landfills must have a series of monitoring wells drilled in many areas around them. The water sample from these must be systematically checked.

10. Your "landfill" was a model of our best landfill. Do you think it is safe enough to eliminate any testing for leachate?

_____

If you think you need monitoring wells, how long do you think they will need to be checked after your landfill is no longer in use? _____

Compost Delight

OBJECTIVE:

The learner will be able to define composting, explain 1) the difference between aerobic and anaerobic decomposition of vegetative waste; 2) how composting reduces in mass and volume vegetative waste; and 3) how it turns into a valuable product which can be used as a soil amendment in the garden.

ACTIVITY IN BRIEF:

Learners will study four compost samples.

GRADE: 7-12

SUBJECTS: science, all subjects

TIME: twice a week, ten weeks

GROUP SIZE: any

SKILLS: observation, recording, researching, interpretation, and experimentation

VOCABULARY: compost, aerobic, anaerobic

CONCEPT: III. Recycling will be accomplished by diverting from waste stream by composting.

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Compost Delight

MATERIALS:

4 large buckets

PROCEDURES: Have the group research composting, define the terms aerobic and anaerobic. Discuss the reasons why composting is important, stress the fact that composing is a solid waste management tool and it turns vegetative wastes into a usable soil amendment.

Composting is the process of turning organic material you would normally throw away - including grass cuttings, coffee grounds, and grapefruit rinds into a rich mixture that can be used to condition soil and provide nutrients for plants. In a compost heap, billions of tiny organisms break down these organic wastes so that they can be used to add nutrients to soil and improve its ability to hold both air and water. (**NOTE:** Meat, fat, and animal (pet) waste should not be placed in the compost material, only plant material.)

Participants create and record data from four compost buckets. Study the buckets each week and at the end of ten weeks answer the discussion questions.

Drill or poke holes in the sides of three of the four buckets, near the bottom. Set up the following conditions in each bucket:

Compost Bucket #1

Compost which is low in nitrogen

- Place mostly leaves and some vegetable and fruit peels in the bucket.
- Moisten, do not soak.
- Turn over regularly, once every three days for the first two weeks, then once per week.

Compost Bucket #2

Compost without enough moisture

- Place a mixture of grass clippings (high in nitrogen - make sure grass clippings are not very wet), leaves, vegetable and fruit peels in the bucket.
- Do not water.
- Turn over regularly, once every 3 days for the first 2 weeks, then once per week.

Compost Bucket #3

Compost without adequate air circulation.

- Place mostly grass clippings (high in nitrogen) in the bucket.
- Keep moist.
- Do not turn.

Compost Bucket #4

- Layer leaves, vegetable and fruit peels, and a small amount of grass clippings in the bucket.
- Keep moist.
- Turn regularly.

Keep a daily record of the temperature of each pile. After a few weeks, discuss the results. Discussion questions:

- Which finished compost is dark and crumbly with much of the original appearance no longer visible?
- Did compost bucket #4 produce the best compost?
- What are the essential ingredients to proper composting?
- How does composting reduce the amount of vegetable waste?
- Which compost piles became anaerobic (without oxygen)?
- Did the anaerobic piles smell bad?

MY LITTLE BIT: Composting is easy to do. Find a corner of your yard that's out of the way and begin composting at home. Carefully throw food wastes (leftovers, eggshells, coffee grounds, spoiled vegetables, etc.) into a pile and mix with dirt. Every week or so, turn the pile over with a shovel to give it more air. In a few

weeks, it will turn into rich, nutritious soil that will be good for growing plants.

WE CAN MAKE A DIFFERENCE: Participants will keep their compost piles going, or bring in their compost from home, and use them to help fertilize the planting of trees. The students could petition local businesses to ask for a donation or support in the access of trees to be planted. Work with the school officials, your community, regional forestor, and/or public utility to determine the best place to plant a tree(s). Use the compost piles to fertilize and mulch the tree(s).

EVALUATION: Daily record keeping with generalizations may serve as evaluation.

EXTENSION: The group may elect to plant a garden on school or public grounds or do some exterior landscaping including bushes, shrubs, flowers, vegetables, as well as trees. Use the compost piles to fertilize and mulch all these areas. (WARNING: Grass clippings treated with herbicides may be a detriment to trees, flowers and shrubs.)

Handout:

Compost

	Bucket 1	Bucket 2	Bucket 3	Bucket 4
Composition of Bucket				
Week 1 appearance temperature				
Week 2 appearance temperature				
Week 3 appearance temperature				
Week 4 appearance temperature				
Week 5 appearance temperature				

Compost Cont.

	Bucket 1	Bucket 2	Bucket 3	Bucket 4
Week 6 appearance temperature				
Week 7 appearance temperature				
Week 8 appearance temperature				
Week 9 appearance temperature				
Week 10 appearance temperature				

Which compost bucket produced the best compost? Why?

_____

_____

_____

What are the essential ingredients to proper composting?

_____

_____

_____

OBJECTIVE:

The learner will be able to define solid waste and categorize possible solutions to reduce waste volume into refuse, reuse, and recycle.

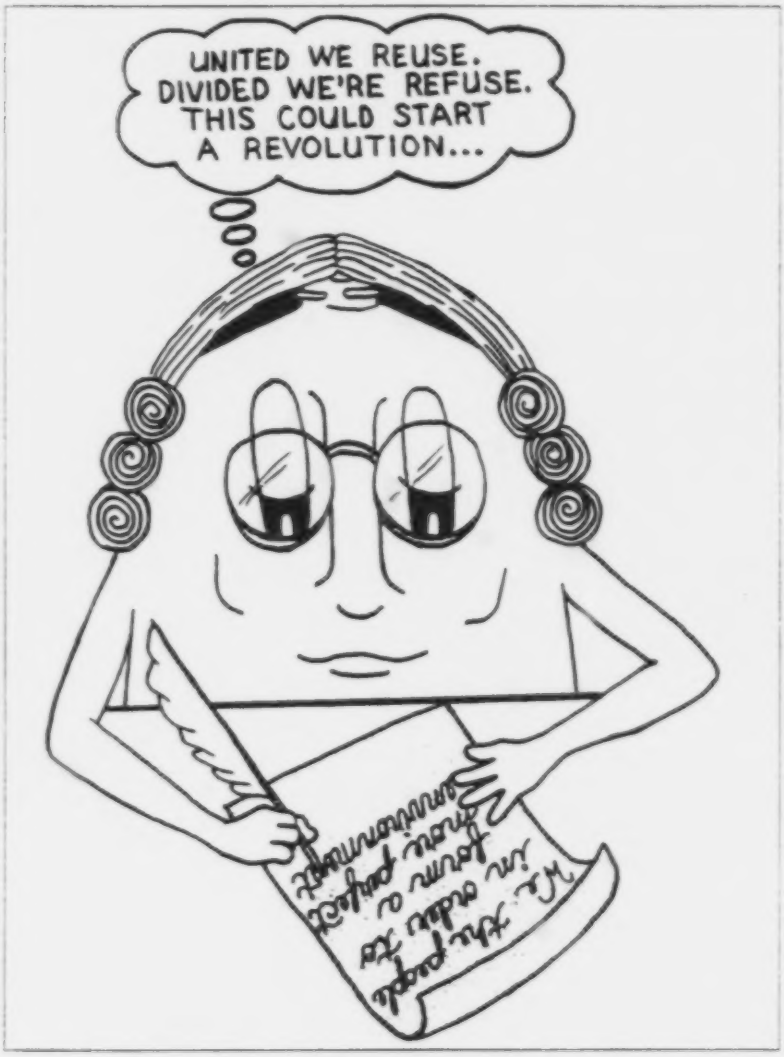
ACTIVITY IN BRIEF:

Learners brainstorm problems and solutions and write a group contract and personal contract to reduce solid waste volume.

MATERIALS:

writing equipment, contracts

PROCEDURES: Ask participants to make a list of the last ten items they purchased at a store. You may get a variety of items because you are not specifying the type of store.



Have participants combine their lists in small groups (3-5) and come up with the five most common responses. Have the groups report out loud and make a total list . With the whole group, take 5-6 of the items from the list and determine how much throw-away packaging or waste there is from each item. Have students write this down so they can see how much it totals. Figure these totals in terms of volume, pounds (by approximation) total plastic, total paper, total metal waste.

GRADE: 9-12

SUBJECTS: social studies, language arts, economics, environmental problems, home economics

TIME: 45-60 minutes

GROUP SIZE: any

SKILLS: observation, brainstorm, analysis, discussion, recording, visualization, writing

VOCABULARY: solid waste, refuse, reuse, recycle

CONCEPT: III. Waste volume reduction can be accomplished by each person refusing, reusing, and recycling.

The Three R's

Define and discuss solid waste. Where it comes from, why manufacturers choose the packaging they do and where it goes after the consumer discards it. This discussion should direct the group to the conclusion that all of us must do something about the solid waste problem.

Participants will work in small groups again to brainstorm ways in which to decrease solid waste and deal with solid waste. Categorize these responses into three areas and record them on the chart; refuse, reuse, and recycle. (Refer to appendix "Ideas That Make a Difference".)

Each small group will report its suggestions to the large group. Come up with three lists from the whole group, one titled "refuse", one for "reuse", and finally, "recycle". Decide what can be done by the whole group to help refuse/reuse/recycle solid waste. Have the group write a contract of what they are willing to do to reduce solid waste, and have all participants sign it. Display and check on progress every two weeks. Display progress (use photos, news releases, stories, etc.).
The participants will make individual contracts to reduce solid waste in their lives. Sign contracts. Make two copies; one for instructor to keep on file (or display) and one for participant to display at home. Check progress every two weeks, report, and record.

MY LITTLE BIT: Participants write letters to the editor of the school or local newspaper advising their audience of their personal commitment.

WE CAN MAKE A DIFFERENCE: The group will make a large poster stating their contractual agreement along with everyone's signatures, and display it in a prominent place.

EVALUATION: Evaluation based on group participation and written contract followed up by progress report.

EXTENSION: This activity may be extended to include younger learners. The older participants could go to the younger groups, talk to them about reducing the volume of waste and have them sign contracts, also.

Participants may write to companies that produce over-packaged products.

I, _____, agree to do my part in reducing solid waste in my world by....

1) _____

2) _____

3) _____

_____
Signature

_____
Date

The Three R's

Refuse	Reuse	Recycle
1)		
2)		
3)		
4)		
5)		
6)		
7)		
8)		
9)		
10)		

We, _____, a devoted group of participants dedicated to reducing the solid waste in our community hereby agree to

1) _____

2) _____

3) _____

Signed

_____

_____

_____

_____

_____

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The Three R's

I, _____ ,

agree to do my part in reducing solid waste in my world by...

1) _____

2) _____

3) _____

_____

Signature

_____

Date

_____

Parent's Signature

Jeans Don't Wear Out!

OBJECTIVE:

The learner will be able to recycle old fabric into usable items that help reduce waste volume.

ACTIVITY IN BRIEF:

Learners will create useful items from recycled clothing.

MATERIALS:

old jeans, sewing supplies

PROCEDURES: Lead discussion of the need to recycle. Make a list of items in your area that are currently being collected for recycling. Discuss what is not being collected and what happens to these materials. Generally, they are taken to a landfill.

Ask learners; "What do you spend a large amount of money on, only to discard a few months later because it is "out-of-style" or "doesn't fit?" The answer of course, is clothing.

Discuss ways in which learners can help reduce waste by reusing or recycling these discarded clothes and, at the same time, avoid using other valuable resources. List ideas.

Choose 1 or 2 of the ideas and follow through by creating recycled usable items. Some suggestions follow, using the ever-popular, and durable, denim material from jeans.

MY LITTLE BIT: All participants make a small bag for carrying a cup and give to someone with the message to refuse using disposable cups.

WE CAN MAKE A DIFFERENCE: Have group publicize its decision to refuse disposable cups by writing a class letter to the local fast food restaurants including pictures of their "recycled cup bags". Encourage the restaurants to set up recycling bins for their own trash.

EVALUATION: Class participation in the brainstorming of ideas, creation of designs, sewing of products, writing of letters and requests can all be a part of evaluation.

EXTENSION: Students may use jeans pockets to hang in school lockers handy for holding mirrors, combs, pens and pencils. Easy to make! May also be embellished with lace and/or embroidery.

Jeans material could easily be used for book covers and cleaning rags, instead of using disposable ones. Encourage individuals to reconsider all disposable products they use, including facial tissue and paper towels. How can they reduce this use? Is there an alternative?

Making recycle bags for drink cups and the use of worn-out jeans has been quite successful as a fund-raising activity.

There are many other kinds of cloth that are good for cleaning a variety of things. Old towels or linens cut down to size are excellent for windows, floors, etc.. Where could cleaning rags be kept? On the porch to wipe off tennies? By the laundry center to be used as applicators for stain removers?

GRADE: 9-12

SUBJECTS: home economics, art minicourses

TIME: extended

GROUP SIZE: any

SKILLS: prediction, analysis, synthesis, measurement, hand-eye coordination, problem solving, evaluation, critical thinking.

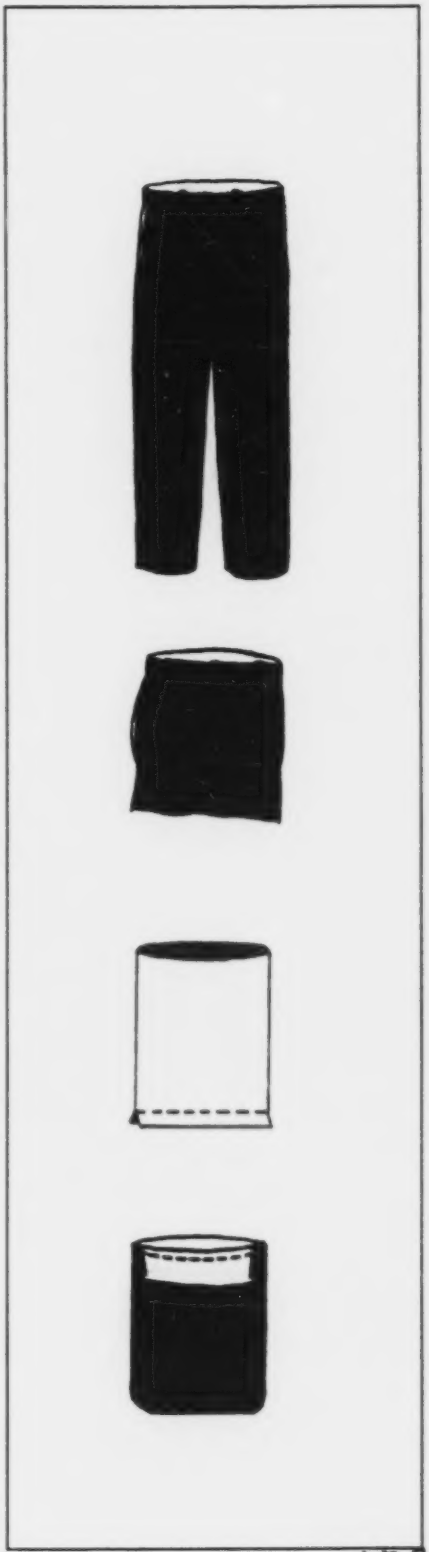
VOCABULARY: reuse, recycle

CONCEPT: IV. Individuals can reduce the volume of the waste stream through product modification and/or reuse.

Jeans Don't Wear Out!

Recycle bag for Drink Cup

To help reduce the use of disposable cups, encourage family and friends to carry their own personal drink cup with them in their vehicle at all times. Use an old pair of jeans to make a recycle bag to hold your drink cup and tea bags, sugar, etc..



Step 1

Step 2

Step 3

Step 4

Step 1:
Cut pant legs at 10" intervals making a 10" tube. (Can usually get 6 bags from 1 pair of jeans)

Step 2:
Add pocket if desired. (Holds tea bags, sugar, creamer...,)

a) Cut 1/2' around entire back pocket of jeans.
b) Pin into place in center of 10" tube.
c) Zig-zag around all edges leaving pocket open in its natural opening. (Since the leg of the jean is a tube shape, the pocket will need to be sewn with the pant leg inside out OR use a free-arm sewing machine.)

Step 3:
With right sides together using a 5/8" seam allowance, sew across bottom of tube forming bag. Turn right side out.

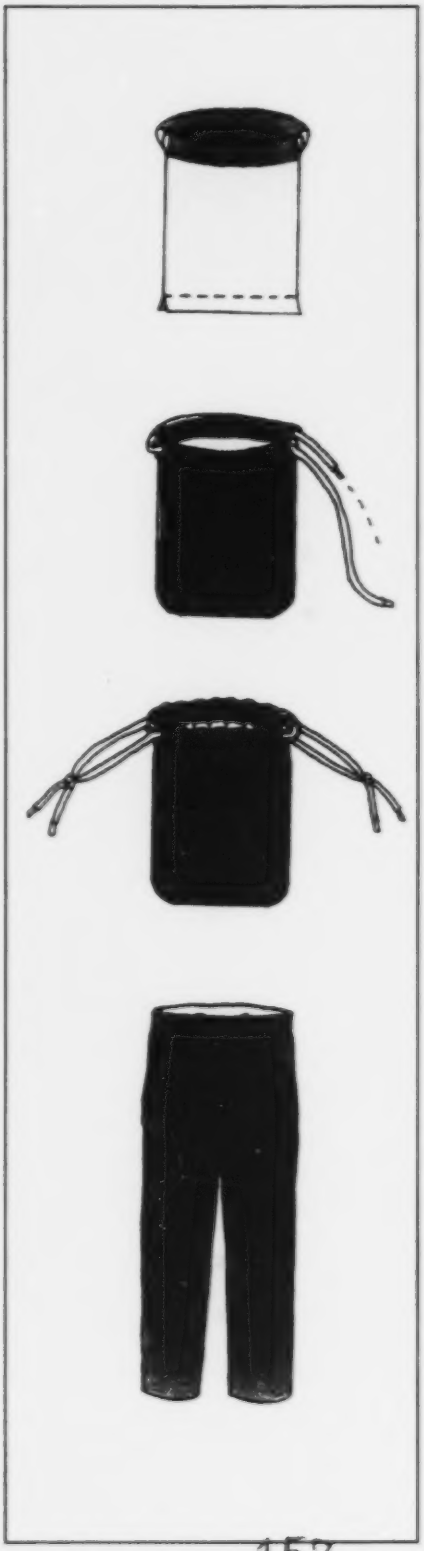
Step 4:

a) For front and back casing, cut two pieces of 1" wide bias tape 1 inch longer than the width of top of bag. Press under 1" on each bias end to cover raw edges.
b) With right sides together, pin bias to front and sew across top using 1/4" seam allowance.
c) Repeat for back.

Recycle bag for Groceries

To help reduce the use of brown paper bags and plastic grocery bags, make and carry your own grocery bag in your car at all times. Use for groceries, when buying small items, plants, or to pick up recyclable aluminum cans!

Hint: You can use the seat of your jeans after using the legs to make drink cup holders (provided you haven't cut the pockets off to make drink cup bags!)



Step 5

Step 6

Step 7

Recycle Bag for Groceries

Step 5:

a) Turn bias tape toward inside of bag and press.
b) Sew bottom edge of bias tape, creating front casing.
c) Repeat for back casing.

Step 6:

Thread 1 clean (recycled) shoe lace through front and back casings and tie ends together.

Step 7:

a) Starting at opposite side opening, thread second shoe lace through casings and tie ends together.
b) Turn right side out and use bag to carry coffee cup or mug. (Use mug instead of polystyrene foam or cardboard.)

Step 1:
Cut through front and back of jeans just below the pockets and toward the center crotch seam.
Step 2:
Turn inside out and stitch across this cut, forming bag.
Step 3:
Use a rope or flexible belt through the belt loops to make carrying easy.
Step 4:
Grocery list, pencil and calculator can be carried in the pockets for easy shopping.

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Jeans Don't Wear Out!

OVERHEAD

Paper	Plastics	Other
Advantages: Disadvantages	Advantages: Disadvantages	Advantages: Disadvantages

RECYCLE YOURSELF A DRESS FROM BIB-OVERALLS

MATERIALS:

fabric, 1-1/2 to 2 yards, depending on the skirt length you want, (26" to 34", finished) thread to match, assorted lace, hand sewing needles, sewing machine, scissors, tape measure, iron, seam ripper, straight pins, tailor's chalk, soap sliver (works well on dark fabric) or various marking pencils sold in fabric stores for marking hems and seams.

1. Skirt

Lay fabric out flat, right (patterned) side up with selvage at top and bottom. Fabric should be 4" more than twice the length of your finished skirt. Take right edge and fold it to the left to meet left edge. Patterned sides of fabric should be facing each other. There should be a fold at the right. See **Diagram A.** Trim the cut edges on the left if they are crooked. Cut on fold so you have two pieces of fabric of equal size. **Diagram B**.

Don't forget to leave length for the seam allowance at the waist and the hem. 5/8 inch is the normal seam allowance. The hem can be adjusted to get the length you want with a one and one-half inch hem as an average, leaving enough fabric to fold the hem twice over, enclosing the raw edge.

2. Sew up the selvage sides to within 6 inches of the ends to leave side openings at the waist of the skirt. **Diagram C.**

3. Fold these side openings (the placket) over. Since this is the selvage edge, one fold will do. Stitch it by hand or machine. See **Diagram D.** (This step might be easier before the skirt sides are sewn together.)

Diagram A.

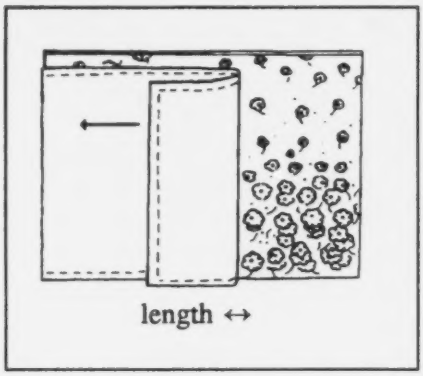


Diagram B.

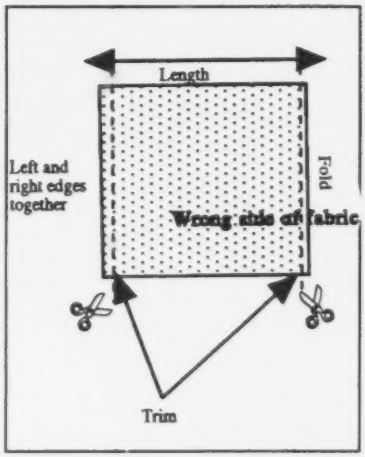
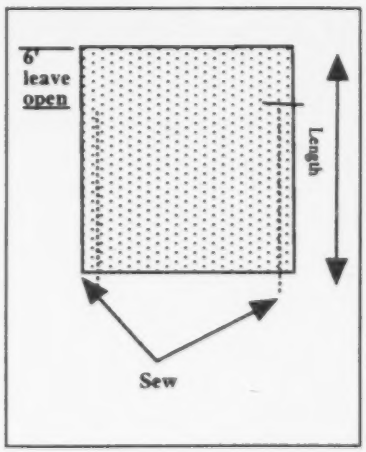


Diagram C.



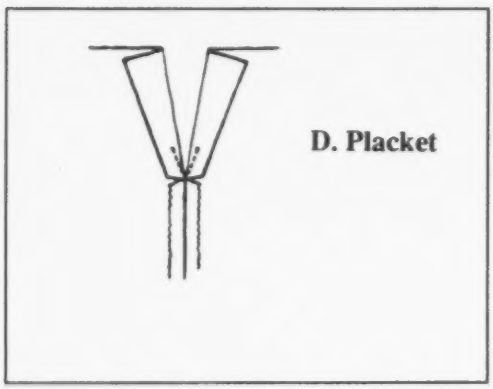


Diagram D.

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Bib-dress

4. Run a gathering stitch around these flaps which are the waist. You will draw up the threads to match the cut-off part of the overalls. **See Diagrams D and E.**

Diagram D

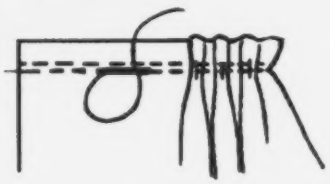
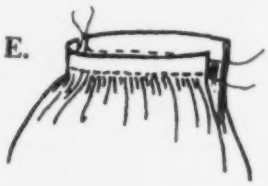
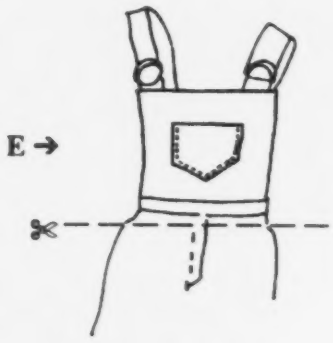


Diagram E





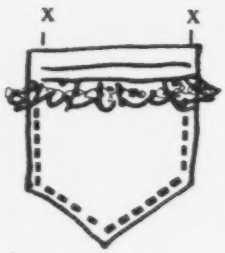
5. Bib. Cut off pants and legs of the overalls just below the waist seam.

*Keep back pockets for the skirt.
**Keep legs to make mug bags.

6. With skirt inside out, place bibs inside and match waist seams. Bibs and skirt should face right sides together which means one will be inside out and upside down.

Sew fronts together pulling gathering thread to fit. Sew back in the same way.

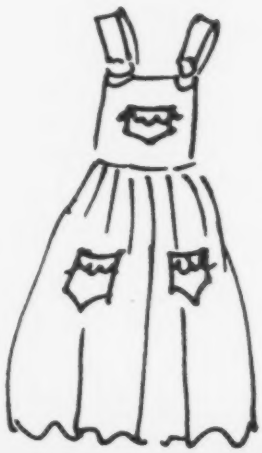
7. Pockets. Carefully remove pockets from overalls. A seam ripper is useful here. Sew decorative lace or other trim across the tops of pockets. Sew pockets onto the skirt using the sewing line that is already there.



Turn ends of lace to back to cover raw edges. Back stitch several times at top of pocket to reinforce (x).

8. Hem skirt.
Lace may also be added to top center front of bibs.

Done! Skirt is belted simply fastening bibs at waist.



Ring Around the Can

OBJECTIVE:

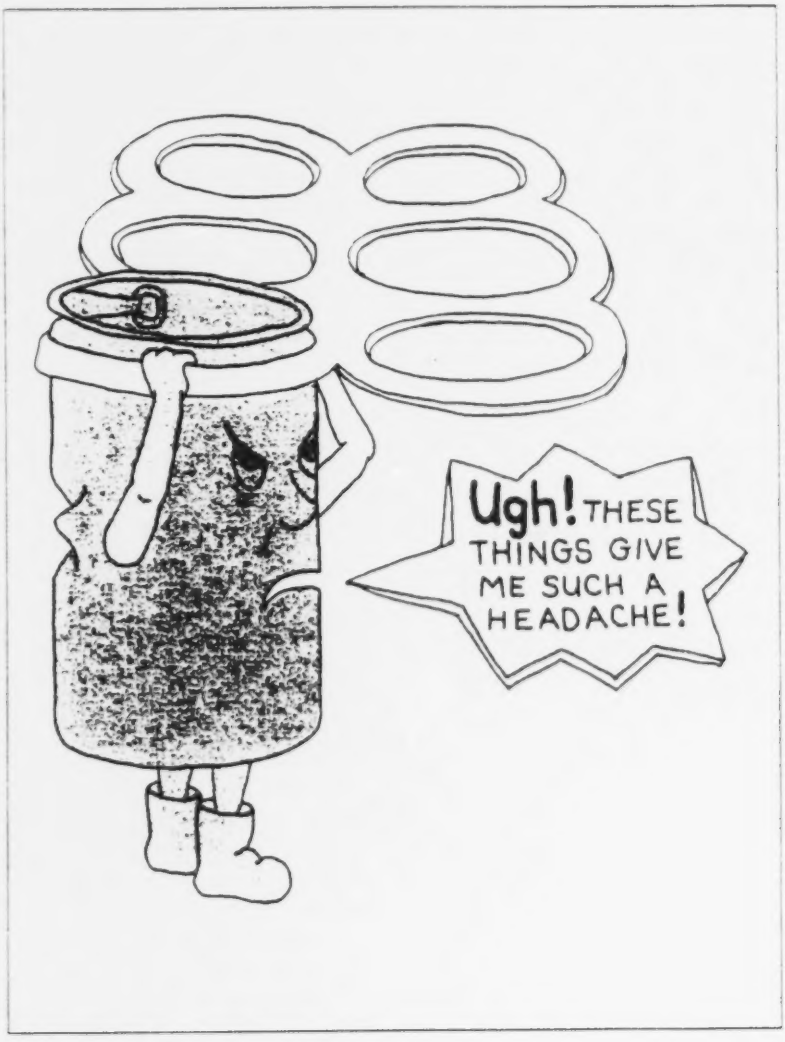
The learner will be able to practice ways to "reuse".

ACTIVITY IN BRIEF:

Learners will be given an item which is usually thrown away and will design ways to use it for five days discussing reduce, reuse, and recycle as life style choices.

MATERIALS:

Plastic six-ring beverage holders for each learner.
Copy of The Giving Tree by Silverstein (may be found with children's books)



GRADE: 7-9

SUBJECTS: social studies, language arts, science, environmental problems, home economics

TIME: 45 minutes to introduce
10 minutes/day for 4 more days

GROUP SIZE: any

SKILLS: application, discussion, synthesis, creation, observation, manipulation, comparison, evaluation

VOCABULARY: reuse, recycle, refuse

CONCEPT: IV. Creativity instigates many possible uses for a product thus reducing the waste stream.

Ring Around the Can

PROCEDURES: Instructor could introduce this activity by wearing or bringing into class on the first day, an example of the reuse of a six-ring plastic soda or fruit juice carrier. Explain to group they will be given a valuable resource to use all week. This is something usually assumed to be a throw away. Give each participant a plastic six-ring beverage holder (that you provide or have the individuals provide). Personify this plastic carrier and emphasize the importance of reusing and not losing this resource/gift. You may substitute a similar disposable item instead of the six ring beverage holder.

Read The Giving Tree by Shel Silverstein to group. Discuss how humankind has used resources, and the need to reduce wasteful uses. Discuss how some resources are being depleted.

Introduce assignment everyday allowing time for participants to demonstrate their creations. For five days the group must reuse their plastic rings. Emphasize use. This use may take different forms, colors, shapes, etc.. (May be given to someone else, who will keep it.) By day five, participants should still have access to their creation(s) and still be using them.

Instructor should also model reuse daily. Everyday, ask for volunteers to "show and tell" their use of their plastic rings. Group can vote on most creative/interesting use. Reward: six pack of soda pop or fruit juice.

Lead discussion everyday involving a few of the following concepts:

1) There is too much waste.

2) Not all waste readily degrades and therefore takes up space.

3) People can choose to purchase goods which reduce waste.

4) Each citizen can reduce the volume of waste he/she produces.

5) Each person can recycle before an item enters the waste stream.

6) Products may be reused, sold, or given away.

7) An Iowa law is in effect that states distributors should not sell beverages with six-pack rings of plastic unless they are bio- or photo-degradable.

MY LITTLE BIT: All learners make a sign/poster to place on their wastebasket at home that says; "Have you thought about reuse?" Participants place these on wastebaskets and practice and discuss reuse at home.

WE CAN MAKE A DIFFERENCE: As a group, set up a "Swap Shop" in your classroom. Have learners bring in and "give away" their trash for someone else's use. Encourage family participation. Refer to "Designing A Rethink Classroom" in the elementary section for more specific ideas.

BACKGROUND: See glossary for the definitions of reuse, recycle, and refuse.

EVALUATION: Creation, use, and discussion of products may be used as evaluation. Group may design a form to be used as evaluation. This form might include: originality, cost, waste, possibility for continued reuse, longevity.

EXTENSION: Instructor make large "Tree" bulletin board to display pictures of all the creations throughout the week. At end of activity, may hang all their final products from branches on the tree. Call the bulletin board "The Giving Tree". Could make a tree mobile instead of a bulletin board. May frame pictures

with pop can rings. Refer to the notes and ideas.

May use this activity to begin a group recycling project.

May have a swap day for the six-ring creations.

Have participants observe and research the bio- or photo-degradable rings and see if they can get them to degrade.

What ultimately makes education environmental is not its subject matter, but its procedures.

--Noel McInnis

Recycled Art

OBJECTIVE:

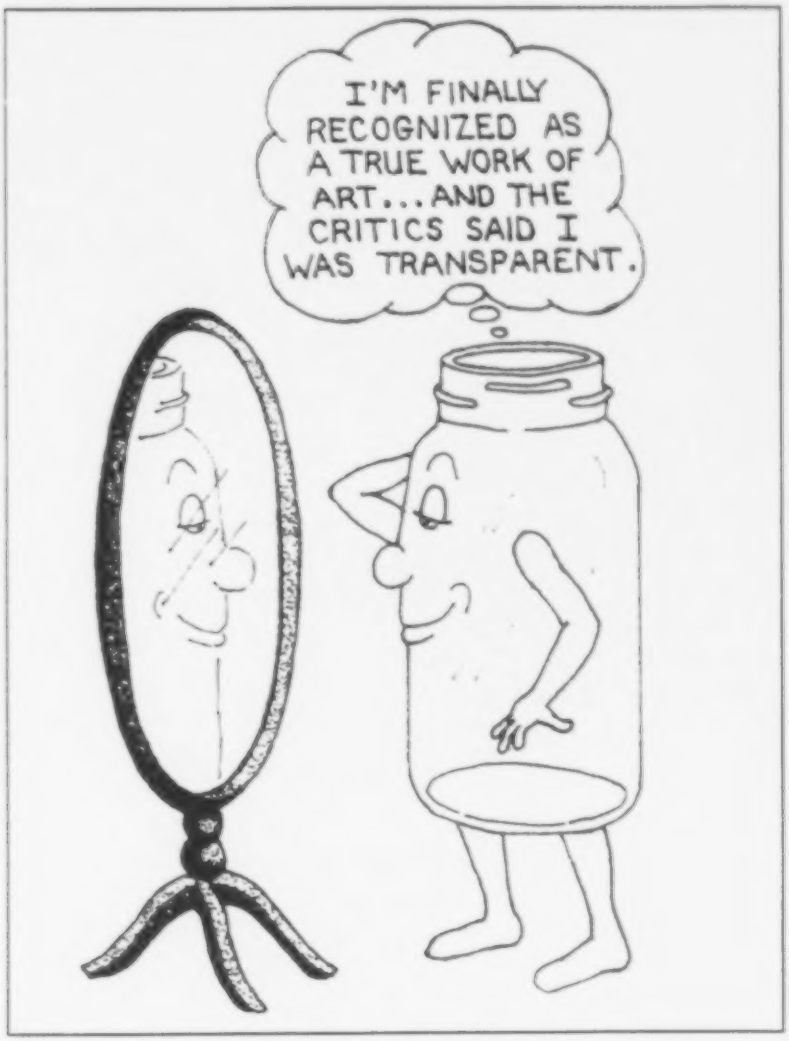
The learner will be able to recognize shape, color, texture and patterns in "trash" and explain how visual art has its origins in natural environments.

ACTIVITY IN BRIEF:

Participants will use "trash" items to create a piece of art.

MATERIALS:

cardboard panels for mounting, glue, paints, brushes, newspapers, magazines, trash items



GRADE: 7-12

SUBJECTS: art, language arts, home economics

TIME: 2-4, 45 minutes

GROUP SIZE: any

SKILLS: artistic creating, manipulation, analysis, research

VOCABULARY: amulets, totems, aesthetic

CONCEPT: IV. Discarded materials may be used to communicate intrinsic values of trash.

Recycled Art

PROCEDURES: Before the lesson, have students collect samples of trash and place them in a bag/box in the room.

Invite participants to show examples of particularly interesting colors, textures, or shapes they have found. Show and discuss pictures or examples of assemblages. Emphasize art elements essential for aesthetically pleasing products. (Color, texture, pattern, rhythm, compositional balance. Artist assistance may prove useful.)

Participants should analyze components and speculate about origins and "life stories" of assemblage parts. Assist in composing the collages. Frame or mat and post student work.

Examine and discuss how other cultures use things that might be considered trash to make amulets, totems, ceremonial items. Bring in pictures of these items.

MY LITTLE BIT: Have participants select a type of litter and develop a list of different ways that particular item could be used. They could "create" one of the items on their list.

WE CAN MAKE A DIFFERENCE: Have participants reduce the volume of waste in their community by designing and assembling a 3-dimensional sculpture of collected litter.

EXTENSION: Participants research the background of the assemblage and present findings to the group orally or write a story. Show the movie video: "The Gods Must Be Crazy", available at many video stores.

EVALUATION: Personal collage and written story may serve as evaluation.

Cost (or Savings) of Reuse of Soft Drink Containers

OBJECTIVE:

The learner will be able to compare costs of recycled containers to one-use of containers.

ACTIVITY IN BRIEF:

Participants will compute total costs of each container's usage and disposal.

MATERIALS:

writing materials (calculators)

GRADE: 9-12

SUBJECTS: math, social studies

TIME: 2 hours

GROUP SIZE: unlimited

SKILLS: description, synthesis, visualization, writing

VOCABULARY: energy use, atmospheric emissions, post-consumer solid waste, industrial solid waste, [British Thermal Unit (BTU)]

CONCEPT: IV. Waste volume reduction is important. Reuse if a cost saving conserves energy and resources. Recycling to original use may require a change in lifestyle.

Cost (or Savings) of Reuse of Soft Drink Containers

PROCEDURES: Your parents and grandparents may well remember when milk and soft drinks came in glass bottles. The empty bottles were returned to the store. When the store collected enough bottles, they were trucked back to the bottling company. Sterilization guaranteed there would be no bacteria left in the bottles. Then each bottle was refilled and sent back to the store. Some bottles made this trip 20 or more times. When the bottle broke or became too badly scratched, the glass was melted down and reformed into another bottle.

In the 1970's, things began to change. Milk started appearing on grocery store shelves in waxed paper cartons and plastic jugs. The soft drink industry switched to plastic and metal containers. Business made this choice, based on costs. They found it cheaper to make millions of plastic or metal containers than to reuse glass ones. Perhaps, for the manufacturer it does cost less. But what about us? We all pay for this through energy and water consumed. Air pollution and increased solid wastes are also part of our cost.

Study the chart below. Use the information to create six bar graphs.

Container costs for 1,000 gallons of soft drink

	Glass	Glass	Aluminum	Plastic	Steel
Times used	19x	1x	1x	1x	1x
Energy (BTU)	$15.90	$64.38	$75.61	$63.33	$38.33
Water (1,000 gal.)	11.35	33.94	15.17	41.71	39.10
Industrial Solid Waste (cubic ft.)	6.59	33.46	36.13	7.21	108.00
Atmospheric Emissions (lbs.)	27.43	55.46	69.00	68.79	18.14
Post-Consumer Solid Waste (cubic ft.)	7.16	40.97	2.07	27.05	3.49

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Cost (or Savings) of Reuse of Soft Drink Containers

Participants can obtain the dollar costs of each of the above six elements by contacting the Iowa Department of Energy and/or local utility and disposal agencies. Apply the dollar amounts to the six bar graphs, then indicate the economic advantages of various approaches.

Indicate the intangible disadvantages of the various same approaches (damage to the earth and environment).

MY LITTLE BIT: I will use only soft drinks that are in reusable containers.

WE CAN MAKE A DIFFERENCE: By sharing the facts with the local community our fellow citizens will possibly change their lifestyles to impact favorably on reduction of wastes.

EXTENSION: Companies may alter current practices (use of different containers), even though cost may increase, to conserve resources.

EVALUATION: Write companies requesting their current practices and predicted changes in practices. Use bar graphs and computations for evaluation.

HANDOUT: Container costs for 1,000 gallons of soft drink.*

*Statistics from Resource and Environmental Profile analysis of nine Beverage Container Alternatives, U.S. EPA; Garbage Reincarnation.

WORKSHEET:

IMPLEMENTATION:

1) Review with participants the reasons why recycling is a wise environmental practice.

2) Distribute the worksheet and assist participants in reading the chart to compare different beverage containers according to the criteria listed.

3) Instruct participants in the formation of a bar graph to compare the energy consumed in producing each type of container, demonstrate how to label the vertical and horizontal sides and explain the importance of a title on the graph so that others will know what is being displayed.

4) Have participants complete five more bar graphs, independently, to demonstrate how each container compares according to the various criteria.

5) Discuss with participants which containers appear to be the best and worse environmental choices. Explain that by recycling the steel, 60 to 70% of the energy is saved. Recycling the aluminum saves 90-95% of the energy. This is, of course, completely lost by using containers only one time.

Education's function is not to promote any propaganda, not to propound any principle as established and fixed for all time, not to assert that any belief is unchangeable, not to assert that any conclusion may not be mistaken -- education's one and overwhelming responsibility is to establish the inquiring habit of mind and a veneration for truth.

--Ernest Martin Hopkins

OBJECTIVE:

The learner will be able to examine five alternatives available to deal with solid waste and establish a suitable strategy for his/her community.

ACTIVITY IN BRIEF:

Learners will work in five small groups to investigate and present a strategy for waste management in their community using a simulation activity.

MATERIALS:

marker pencils.
newsprint

GRADE: 9-12

SUBJECTS: social studies, science, language arts, environmental problems

TIME: 3 class periods

GROUP SIZE: 4-6 members/group

SKILLS: analysis, comparing similarities and differences, debate, description, discussion, estimation, evaluation, listening, listing, problem solving, public speaking, reporting, research, small group work, synthesis

VOCABULARY: City Council, County Board of Supervisors, recycle, landfill, incineration, curbside, recycling, pre-cycling production, drop-off recycling, curb side recycling, pre-cycling

CONCEPT: IV.

1. There are numerous ways to manage solid waste.
2. The strategy for solid waste management will be different in communities, depending upon a variety of factors.
3. Recycle, reuse, or refuse to purchase is an effective solid waste management strategy.

Political Choices

PROCEDURES: Participants will be grouped into five equal groups. They will be given one card with a form of solid waste management and some advantages and disadvantages of that practice. (There are other advantages and disadvantages that they will need to discover.) They will be told that they are to present a case to the City Council or the County Board of Supervisors supporting the solid waste management strategy their city or county should retain or move toward. Each group will guard its background information and seek ways of discrediting other strategies due to cost, environmental impact or other researched criteria.

Participants will be provided materials and publications with pertinent information. Information may be procured from the county waste management authority, the landfill operator, city, State Department of Natural Resources, solid waste publications, etc., which will have useful research materials. Two class periods may be used for researching a presentation for the City Council or County Board. Midway through the second period each group will be told they must select one of their members to serve on the five member City Council or County board. The Council or County Board will then determine information they will consider to make their decision.

Each group will give a three minute report. Visuals should be used and each member should have some responsibility in making the presentation.

The learners will be told that their community has a population that approximates the size of the community where most of them live, and the description below should be visually shown.

There are as follows:

25 households for every 100 people
1 place of business for each 25 people
10 industries, manufacturing plants, etc.. for every 200 people i.e., grain elevator, feed mills, plastic plant, small engine assembly, slaughtering plant, etc.
1 supermarket for each 2,000 people
1 hospital for each 50,000 people or less
4 nursing homes for each 2,000 people or less
5 multi-dwelling apartment complexes for each 1,000 people
1 school district similar in size to their school district

* The manufacturing plants and industries may reflect the nature of such plants in the learners' area.

ACTIVITY: Simulation is an effective means of involving students in group process to examine scenarios useful to resolve a problem. It provides opportunity for all participants to become involved and serves as a conduit used in political science to examine information and make a decision upon the information provided. Simulation provides the learner with a competitive challenge to scientific research data and persuades his/her colleagues to make a decision regarding an actual or perceived problem.

In this activity, the group will examine a variety of strategies its community could employ to manage solid waste. The activity also advances a variety of methods communities throughout the country are now using, which learners may encounter, if and when they move elsewhere.

Community size, distance from recycling markets, culture and traditions are important. What works in one community may not be suitable for another, therefore it becomes important to explore as many of the advantages and disadvantages as possible to arrive at a suitable solution.

The cards provided each group reflects only

some of the pros and cons of the practice. Encourage use of the telephone, interview practices and other devices that access additional information. It should be noted the information on the card **is not always accurate and does make assumptions.** also information from any source directly involved in the practice is likely to be biased in favor of that practice and likely to downplay the disadvantages. Each inaccuracy or assumption is indicated with an asterisk. The presenter may wish to white this out before duplicating the cards. Also, the 'NIMBY' effect (Not In My Back Yard) is not mentioned.

LANDFILL-TAXPAYER ASSOCIATION GROUP — Card 1.

Currently this process is used by the community of Midstate.

Some benefits of landfill

* a. Land suitable for landfills is available at a reasonable price.
b. Landfills can be sealed to minimize groundwater contamination.
* c. Landfills will always be needed because all forms of solid waste cannot presently be economically recycled.
d. Landfills are the least costly means of disposing solid waste.
* e. Landfills could be mined at a later date if resource recovery become a necessity.
f. Landfills provide archaeologists of the future with a storehouse of information to interpret cultures.
g. Landfills of some form have been used by humankind from day one.
h. Landfills have a comparatively low cost of operation for taxpayers.
* i. Landfills encourage people not to dump in other places.

Some problems with landfills:

a. They do fill up.
* b. Recycling is limited if the public believes waste can be put in a landfill.

As a member of Taxpayer Association, do research to find other positive or negative aspects on landfill operations to justify your position to continue this practice.

INCINERATION — Card 2.

Some benefits of incineration

a. Most waste materials do not need to be placed in landfills.
b. Waste materials are reduced in volume to a comparatively small amount of ash.
c. Incineration can be done on one central site and often can benefit more than one community.
* d. Incineration can often be shown to be cost effective.

Some disadvantages of incineration

a. Air pollution.
b. Ash needs to be buried.
c. This process does not encourage recycling.
d. Landfills are still necessary.

As a member of the Incineration-Taxpayer Association do research to find other positive or negative aspects of incineration operations to justify your position to continue this practice.

ENERGY SOURCE PRODUCTION Card 3.

Some benefits of energy source production

a. Most waste materials do not need to be placed in landfills.
b. Waste materials are reduced in volume to a comparatively small amount of ash.
c. Incineration can be done on one central site and often can benefit more than one community.
d. Energy production can often be shown to be cost effective.
e. Steam can be generated from electrical energy production.

Some disadvantages of energy source production:

a. Outlets for electrical production and steam heat must be located.
b. Air pollution.
c. Ash needs to be buried.
d. This process does not encourage recycling.

As a member of the Energy Source Production Taxpayer Association do research to find other positive or negative aspects of energy source production operations to justify your position to continue this practice.

VOLUNTARY DROP-OFF RECYCLING Card 4.

Advantages

a. Community members are provided an opportunity to minimize solid waste going to the landfill.
b. Employment opportunities are provided for individuals sometimes difficult to place in employable positions.
c. People are encouraged to examine alternatives prior to making a purchase, including selection of a less packaged item, or not purchasing at all.
d. Recycling promotes the use of materials for some other beneficial purpose.
e. Recycling allows reentry of useful resources into the marketing system thereby lessening dependency upon virgin materials.
* f. Environment benefits because of fewer impacts.

Disadvantages

a. An extensive community education program is required.
b. Recycling is not free and may be labor intensive.
c. Recyclable items may not always be marketable, or the markets may be considerable distance away.
d. Landfills or some other disposal system may still be required.
e. Some people may not want to change their lifestyle to begin recycling.

As a member of Voluntary Drop-Off Recycling-Taxpayer Association do research to find other positive or negative aspects of voluntary drop-off recycling operations to justify your position to continue this practice.

CURBSIDE RECYCLING **Card 5.**

Advantages

* a. Most items will be recycled.
b. Considerably less volume of materials will be landfilled.
c. Yard waste compaction may be accomplished with curb side recycling.
* d. People are given responsibility for items they may purchase and will give greater attention to accumulating items that potentially may reach the waste stream.

Disadvantages

a. People are forced into a lifestyle they may not choose.
b. It may be more costly to ship and handle recyclable materials.

As a member of the Curbside Recycling-Taxpayer Association do research to find other positive or negative aspects of curbside recycling operations to justify your position to continue this practice.

Further research on all of the above will be essential. There are more advantages and disadvantages for the above for student research. Sources to examine include:

Recyclers Handbook
Earthworks Press
1400 Shattuck Avenue #25
Berkeley, California 94709
Approx. $4.95

MY LITTLE BIT: Invite responsible persons involved with solid waste management to present state of the art strategies implemented or contemplated for their community.

WE CAN MAKE A DIFFERENCE: The group consensus of the best strategy will be presented to the City Council or County Board at the first possible opportunity.

EXTENSION: Field trips to the land fill and recycling facility if available.

EVALUATION: The group will assemble the combination of the best choices available and

BACKGROUND INFORMATION:
There are many ways of disposing of waste, but whatever the practice may be, there is no such place as 'away'. It must go someplace, and the benefits to society need to be considered for whatever practice is used. Usually it is more economical to recycle a product than to produce from virgin materials, and generally this practice has a less negative impact on the environment. Many current practices encourage the "throw away" strategy, but is that the best practice in the long run? Ideally, thought and consideration should be given to the product considered for purchase in the first place. Questions regarding suitable alternatives should be raised and exposed in the area of pre-cycling. That is to say, if disposal is a problem, do I need this item, and what could I do to displace this problem? This raises interesting questions and possibilities.

The City Council should meet while the small groups are completing their reports and establish the criteria they will use to decide their choice. They should also elect a chairperson to conduct the meeting.

Political Choices

After the reports have been given and the City Council retreats to make its decision, the group should assemble a list of items they think the Council considered to make their decision. After the Council returns with its decision, the Council list and group list should be examined as a means of arriving at closure for the presentations and activity.

Note: Occasionally, to add a bit of levity, one or two hecklers who are adamant about their presentation and position may be planted to add some confusion and disruption to the presentation. Also, Council members may wish to use facetious names, i.e., I May B Had; D. Trump; Cash McCoy; etc.. This is the Council's option.

A group report of its findings is submitted to the solid waste management authority in the community.

"Recycle This", Dow Chemical Company, 690 Building, Customer Information Center, Midland, Michigan 48640 (1-800-441-7369).

HANDOUT:

five group cards

Recycling Poetry

OBJECTIVE:

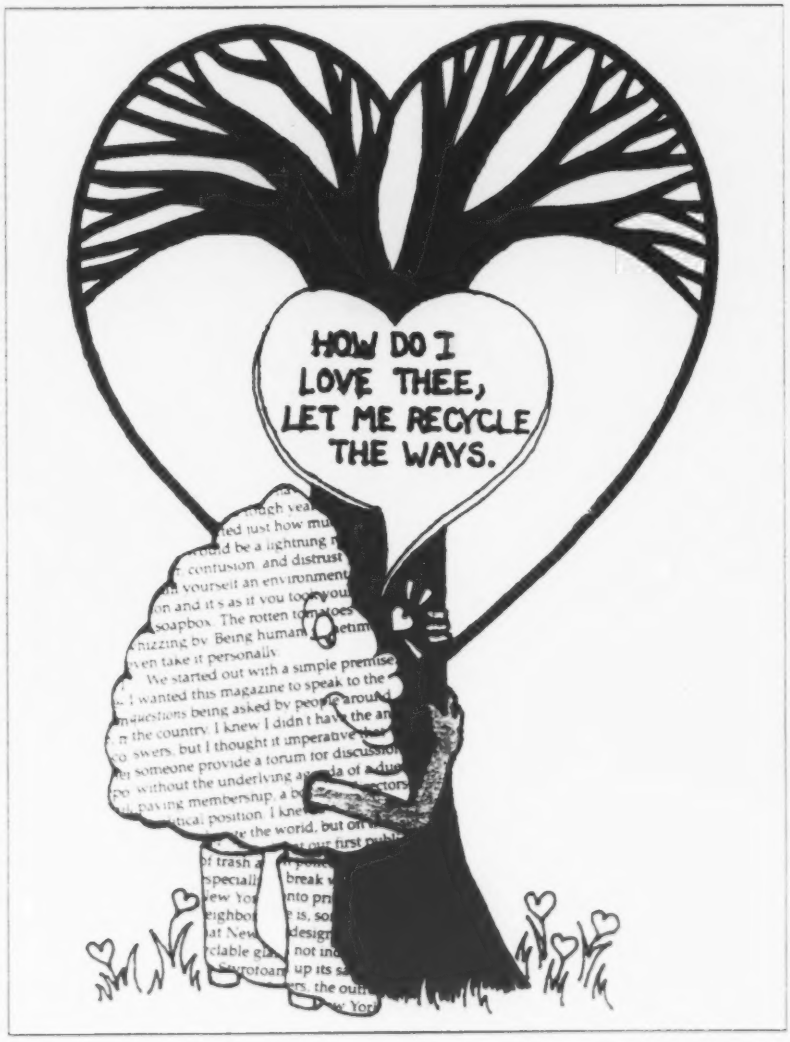
The learner will be able to recognize and experience the inspirational value of waste management through recycling.

ACTIVITY IN BRIEF:

Participants write poetry related to recycling.

MATERIALS:

writing materials



GRADE: 7-8

SUBJECTS: language arts, social studies, environmental problems, science

TIME: 2 class periods

GROUP SIZE: Any class size

SKILLS: description, invention, synthesis, visualization, writing

VOCABULARY: cinquain, haiku, diamante

CONCEPT: V. Citizens as well as municipalities have responsibility for waste management. Recycling requires a change in lifestyle.

BEST COPY AVAILABLE

Recycling Poetry

PROCEDURES:

1) Everyone can be a poet, at least to some extent — and yet lots of people think any kind of poet's expression is beyond their capacities. This activity is designed for every participant — or group of participants — to create a poem.

2) Poems can be free verse or rhyming. Cinquain and haiku are interesting forms. Or do a group poem. Every person thinks of a thing about waste or recycling. Each person contributes one word. One or more participants or the instructor can put all the words together to form the poem while others discuss their experiences in being concerned about recycling. Note: Participants can imagine that they are a product that is used and changed into waste, and that then becomes recycled.

3) Optional: Here are a few examples of poetic forms which can be used. These have been excerpted and adopted from Project Wild, Secondary, 1983, 1985 Western Regional Environmental Education Council, and previously from Project Learning Tree (Washington, D.C.: American Forest Institute, 1977).

Haiku - Haiku, originated by the Japanese, consists of three lines of five, seven, and five syllables each. The emphasis is syllabic, not rhyming. For example:

aluminum can
made into a useful tool
guide to harmony

Cinquain - Cinquain is derived from the French and Spanish words for five. This form of poetry is also based on syllables — or may be based on number of words — but there are five lines. Each line has a mandatory purpose and number of syllables or words. These are: 1) the title in two syllables (or two words); 2) a description of the title in four syllables (or words); 3) a description of the action in six syllables (or words); 4) a description of a feeling in eight syllables (or words); and 5) another word for the title in two syllables (or words). Here are two examples, the first using syllables and the second using words:

paper
vital, useful
remade to serve again
too often wasted by us all
unfair

---

cardboard box
containers of our things
holds, protects, surrounds, stores, carries, covers
convenient, useful, inexpensive, adaptable,
strong for its weight
unlimited uses

Diamante - Diamante is a poem shaped in the form of a diamond. It can be used to show the words are related through shades of meaning from one extreme to the opposite extreme, and beginning and ending nouns could be natural resources. A pattern of parts of speech are as follows:

noun
adjective adjective
participle participle participle
noun noun noun noun
participle participle participle
adjective adjective
noun

Recycling Poetry

Example:

sapling
taller thicker
living growing maturing
wood paper printed read
bundled reformed fiber-board
wall construction
house

The completed poems can be typed or printed neatly — and then displayed with a photograph or black and white pen and ink drawing of the product. Here is an example of free verse with a drawing:

Seed
sun soil rain
roots, stem, branches, leaves
longer, stronger, wider, taller
grows into wood, cut for lumber, used to build
to construct, used for script, for packaging
first one use, then another, another
never discarded, nor lost
many many uses
none wasted
precious

MY LITTLE BIT: Write poetry expressing concern for waste management.

WE CAN MAKE A DIFFERENCE: Send poetry to school or local newspaper to be published and read by others.

EXTENSION: Poems can be laminated and used for placemats at a local restaurant. May make into posters and display in stores, schools, etc..

Recycling Poetry

EVALUATION: Collect many examples to compile into a booklet/handout. This may be sold as a fund raiser, printed on recycled paper. Use poetry as evaluation.

STUDENT HANDOUTS: Copies of the four sample poems and the patterns and form to be followed, or make into overhead (to save paper!)

Paper or Plastic

OBJECTIVE:

The learner will be able to determine the public's preference in use of paper, plastic or BYOB (Bring Your Own Bag).

ACTIVITY IN BRIEF:

Participants will design and conduct a survey at their nearest/most convenient grocery story. The survey will be an observational quantitative experience (participants will observe and tabulate) to determine what shoppers prefer to use when grocery shopping.

MATERIALS:

paper and pencil

GRADE: 7-12

SUBJECTS: math, science, language arts, home economics, environmental problems

TIME: 60 minutes

GROUP SIZE: groups of 2-3, group discussion

SKILLS: knowledge, comprehension, application, analysis, synthesis, evaluation

VOCABULARY: nondegradable plastic, degradable plastic, paper bags

CONCEPT: V. Volume reduction is a goal of reducing, reusing and recycling.

Paper or Plastic

PROCEDURES: Participants predict the number of people who prefer paper bags, those who prefer plastic bags and those who bring their own containers for grocery shopping. Learners, in small groups, develop an instrument for tabulating observations at a grocery store. Learners, as a large group, reach consensus on the model they would all prefer to use. Learners may then, with permission of store managers, observe the preferences of shoppers. Groups of one to three would be best, depending on the size of the store. Learners report results by placing data on a wall chart and compare bag preferences. Instructor shows samples of each and discuss how certain grocery items may generate advantages/disadvantages of each type of bag. (Use overhead) Instructor reinforces with background information. Instructor asks key questions in the extension section.

MY LITTLE BIT: The learner will refuse a bag and/or bring his/her own bag each time they shop.

WE CAN MAKE A DIFFERENCE: We find that a large amount of plastic and paper is used for carrying groceries. These materials also fill our landfills. By using our own bags or reusing grocery sacks, we can make a difference on the amount of disposable paper and plastic.

Keep track of the amount of bags recycled by your group and possibly even the local grocery. Write a thank you to the grocery for their efforts.

EXTENSION:

1. Participants could interview shoppers about their reasons for selecting paper, plastic or BYOB.

2. Participants could design and sell, or purchase for resale, cloth bags or string bags for shoppers.

3. Participants could design and make: posters, public service announcements (PSA's) and/or brief notes to be used for public education.

4. Participants can determine the amount of bags used by that store or all community stores in a day, month, year from data collected through observations.

5. Participants can survey managers to determine how many bags are used and the total value of those bags used in a day, month or year.

EVALUATION: Participants would be graded or given points based upon participation and charts.

BACKGROUND: A partial list of advantages/disadvantages is included for discussion purposes. Refer to appendix for more information.

Paper or Plastic

Handout:

	Advantages	Disadvantages
Paper -	recyclable (sometimes) as a bag - reusable as wrapping - reusable from renewable resource	requires a lot of wood recycled into lower value paper not as strong/wet & tears easily requires large amount of energy/by-product is pollution some recyclers will not take grocery bags
Plastic -	takes up less space great strength can be reused can be used under various circumstances in-store recyclable (usually)	produced from petroleum (nonrenewable) not easily degraded requires large amount of energy

Extension: Have participants research the dilemma; paper vs. plastic and list all advantages and disadvantages of each.

Urban Sprawl

In 1980, there were 4.4 billion people on Earth. In 1990, there will be 5.2 billion. Every day, some of these human beings move into places on the planet where only plants and animals used to live. Forests are cut down. Wetlands, oceans, ice caps, and prairies are invaded.

-- Russell Train, World Wildlife Fund, U.S.

Lights, Camera, Action!

OBJECTIVE:

The learner will be able to identify some of the influences, appeals, and techniques advertisers use to promote products.

ACTIVITY IN BRIEF:

The participants will observe and critique a commercial or public service announcement. They will then determine some guidelines and procedures to produce their own public service announcement.

MATERIALS:

VCR camera, blank video tape, VCR, tape recorder, pencils, paper, tape, markers, resource books, pretaped commercials

GRADE: 7-12
SUBJECTS: language arts, speech, social studies, drama, art
TIME: five, 45 minute class periods
GROUP SIZE: This activity will lend itself to a cooperative learning activity. Participants may be allowed to work in groups of four or five.

SKILLS: observation, group dynamics, recording, writing, public speaking, critical thinking

VOCABULARY: recycling, commercial, public service announcements (PSA's)

CONCEPT: V. Recycling is an acceptable alternative.

Lights, Camera, Action

PROCEDURES:

1. **Day 1** — Participants will view and discuss various TV commercials, (instructor needs to tape before session). List pros and cons of environmental impact and recycling possibilities. Discuss in depth the reasons that the commercial has been produced to show the message that it portrays. Could the commercial be changed to reduce the environmental consequences of the product?

2. **Day 2** — After the participants have a feel for the commercials, allow them time to discuss and begin to brainstorm ideas for their own commercials. Bring the whole group together to share ideas and generate new ones.

3. Participants should identify a product i.e., cleaner, hair care product, agricultural product, and begin to produce their own commercial. As a group they should be allowed to choose the medium for their commercial (newspapers, magazines, TV, radio, or other). They should make it as close to reality as they can. Instructor should encourage the use of props, cue cards, role playing, costumes, etc..

4. Present the commercials to the large group, or ideally, to another group (younger children, adults, community leaders, etc.).

MY LITTLE BIT: The participant will call or write a studio to see if they would play the commercial. Write the producer of the product and state the concerns or lack thereof for the product involved.

WE CAN MAKE A DIFFERENCE: After exploring the consequences consider a campaign, petition drive, or boycott of the products that are using poor environmental practices. Each participant should contact at least one person and discuss his/her concerns, if they feel they have a legitimate position for their actions.

EXTENSION: Contact advertising companies and invite them in to tell their side of the story and hold a discussion about your concerns.

EVALUATION: Teacher observations, peer grading, discussions. Write a recycling rap song.

BACKGROUND: An advertising representative from the media should be invited into the learning situation to discuss important elements of effective advertising, such as: length of radio or TV advertisements, page location, style, visuals or printed material, delivery, eye appeal, voice inflection, and other considerations. Also, the difference between public service announcements, paid advertising and legal implications of both forms might be discussed.

The following pages may be copied and distributed to students to provide technical background information for developing commercials.

Writing and Producing Your Own TV Commercial

It starts with an idea.

The first thing you'll need to write and produce your own TV spot is an *idea*. Ask yourself these questions: What message do I want to convey? How can I show this message in a way that is clear and will attract attention? What words will may actors or off-camera announcers be speaking? Can I make my commercial an intersting 30 second story?

Turn your idea into words.

Once you have your idea, turn it into words. Let's say your idea is to show what happens to a soft drink container after the contents have been consumed. What exact words will your off-camera announcer be speaking? Write down one or more possible scripts - figuring about 2 words per second. If you intend to have all of your 30 second spot filled with talking, that means you should write 55 to 65 words. If only part of your spot has dialogue or speaking, you'll want to use fewer words. After writing your script, read it out loud. Does it sound realistic... or does it sound unnatural? Keep writing and re-writing your script until it sounds believable and makes a statement that people will listen to and understand. Make sure your beginning words draw people into the spot... and that your ending is either powerful, humorous or memorable.

Turn your idea and words into pictures.

TV communicates with images. Take advantage of that by thinking of the strongest, most vivid, most imaginative pictures that you can. Again, going back to our example of a soft drink container - what could you do to make that image as dramatic as possible? Put it in a spotlight? Show it through a dense fog of smoke? Photograph it from up close? Have pile of broken and unbroken bottles instead of just one. Show a container being cast off into a ditch or being added to the pile. These are all visual possibilities. Your own mind is the only limit to what you can show. Think graphically... and *let your pictures carry the emotion and impact of your commercial..*

Putting the words and pictures together.

Take a blank sheet of paper, and draw a line from top to bottom down the middle. On the left-hand side you will write all your visuals. Describe each visual action in detail (for example, camera moves in right to a container in the hand. The hand moves outward to toss the container towards the pile. The pile is scattered and broken with additional debris. On the right hand side of the paper, write down your words or copy... so that your dialogue or off-camera announcer's words are written down next to the visual action that takes place at the same time. In other words, if your announcer says "here, you can be a part of the problem or the solution." Write those words next to the picture of the action that takes place at that time. By writing down the visual actions and words next to each other on the paper, you can tell at a glance, exactly what is going to be happening - words and pictures together - in your spot.

The Storyboard tells the story.

What follows is a storyboard. In each frame, sketch a rough picture of what you'll show on the screen. Under each frame, describe what is happening, and write the dialogue that goes with that picture. (See "Storyboard Guidelines").

Rehearsing and planning are important.

Several days before your scheduled shooting date, take your storyboard and talk to the direc-

tor of the commercial about it. Together you can plan on how you will shoot the spot. Also, you'll want to decide on what props you need. You must have all your props together before you shoot the commercial. In addition, if you are using actors, have them fully rehearsed so you don't waste time in the studio. If you are using any other elements, such as a piece of music, or an off-camera announcer, it would be wise to have these audio elements already recorded before you go into a video studio.

Your judgement makes the difference.

This is the time when your concept comes to fruition. In the capable hands of the director, cameraman, acting and voice talent and video technicians, your idea should come off without a hitch, provided you have preplanned everything with care. So, your job during the actual production of the spot is to offer opinions and feelings about what is going on. The director's job is to instruct the crew and talent.

Putting it all together.

Sometimes, your commercial cannot be shot in a single, 30-second "take." In such a case, your spot will be filmed in short sequences, and edited together. This takes place after the spot has been shot. Editing the spot, or putting it all together, can take a few minutes, or several hours depending on how many scenes have to be edited together. If your spot takes place in a single setting, with little action, editing time will be short. On the other hand, if you are cutting back and forth from scene-to-scene... or if you are changing your pictures to coincide with a piece of music, the editing process can be time-consuming.

It's finally over!

It is finished... and it represents a lot of hard work—and plenty of fun—by everyone who contributed. Since this was your first commercial, you've probably made a few mistakes along the way ...but don't feel bad—even seasoned writers and producers make an occasional blunder. The important thing is that you created something that reflects your views on an important subject... and you learned a lot about writing and producing television along the way!

Adapted from:
Writing and Producing Your Own TV Commercial
You Can Do It!
KidVid Project, KTIV Channel 4 and
Siouxland CARES, Sioux City, Iowa

STORYBOARD GUIDELINES:

On the radio, only words are used to get a message across. In video, the message has to be conveyed with the help of pictures. You need to show your audience, don't just tell them.

A storyboard is similar to a comic strip. The action unfolds in a series of still pictures.

Narration, dialogue, music, sound effects, and camera movements are written under or next to each frame.

Steps in Storyboard Production

1. Get a picture in your mind of what you would like to show your audience. The visual aspect of your message should go along with the words you've written, but should add interest or excitement to that message.

A good thing to do is think of what on TV appeals to you. What messages do you remember, and how were they conveyed?

2. Start drawing pictures of your message. Draw a picture of each separate part of the message.

3. Look over the pictures you've drawn. Now think about how you'll present those pictures in front of a camera, not a video camera, just your parents' Minolta, for example.

4. Work your pictures into individual frames for the camera. Each frame should be related, together they should show some continuity of action.

You can add interest to the pictures if you imagine yourself to be a professional photographer, taking pictures from all different angles, all different zooms.

Decide which angles and which zooms look best. Once you've drawn each camera frame of your message, you've got your storyboard.

5. Now consider how the action in your pictures would look in video. Think of the pictures you've drawn as one continuous action story. How would you bring those pictures to life? How would you act them out?

Rehearse before you get in front of the camera. But once you are in front of it, try to forget it's there. By pretending you're still just rehearsing, you'll be less nervous and more natural. That's one of the keys to an effective message.

Camera Guidelines

In the studio, you'll be able to use two cameras; keep this in mind as you draw your storyboard and write your script instructions.

Let's say Camera 1 is set up directly in front of the scene to take a wide shot of all the action. Perhaps camera 2 can be set at a 45-degree angle to the scene, zoomed in to a close-up shot of whatever action is taking place.

Your script will have to designate which camera is in use for each shot. Your storyboard will have to show the type of shot you plan to have.

TYPES OF SHOTS

High angle shot—The camera is higher than the action, looking down on it. This tends to make the action or speaker smaller or less important in the eye of the viewer. Viewers may feel a sense of superiority when viewing this angle.

Low angle shot—The camera is close to the ground looking up at the subject. This makes the subject bigger, more dominant in the viewer's mind. The viewer may feel less in control or less superior.

Focal point—Telephone Hotline (fig. 12)

Wide shot—Takes in the whole scene or entire person (fig. 1b)

Medium shot—Usually head and shoulders or from the waist up (fig. 1c)

Close-up—Tight on the head or on the action (fig. 1d)

Extreme close up—One element of the action or of the person's face (figure 1e)

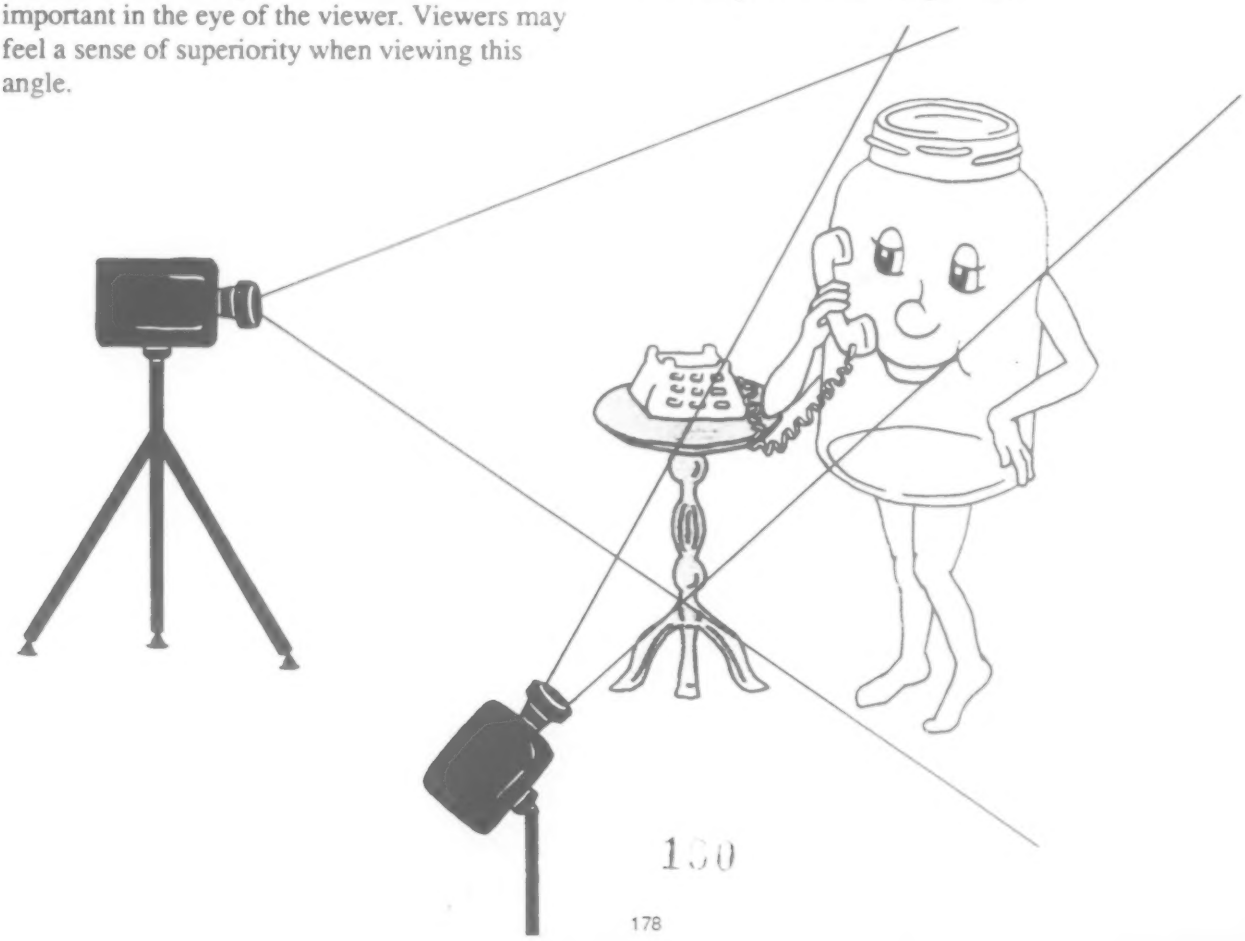


Fig. 12

Fig. 1b

Fig. 1c

Fig. 1d

Fig. 1e

Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has.

Margaret Mead

Shop and Save

OBJECTIVE:

The learner will be able to:

1. Classify materials as biodegradable or non-biodegradable.
2. Classify some house-hold products as hazardous or non-hazardous.
3. Classify materials as recyclable, reusable, renewable, or none of these.
4. Decide on the value of a product based on its impact on the solid waste stream.

ACTIVITY IN BRIEF:

The learners will make purchasing decisions about products displayed based on their impact on the solid waste stream.

PROCEDURES:

MATERIALS:

worksheet

GRADE: 7-12

SUBJECTS: biology, chemistry, earth science, home economics, environmental problems

TIME: 45 minutes

GROUP SIZE: any size; small groups of 2-4

SKILLS: classification, listing, observation, analysis, researching, interpretation, critical thinking,, identification, visualization, evaluation

VOCABULARY: biodegradable, recyclable, hazardous, reusable, renewable, nonrenewable, nonbiodegradable, phosphate

CONCEPT: V. Smart shopping requires concern for cost and environmental factors and people can choose to purchase goods which minimize waste.

1. Gather products for ten stations. Examples:

   Station 1 Candy - single bar and pack age of small bars
   Station 2 Pop - plastic bottle, glass bottle, can
   Station 3 Breakfast bar - recycled box and nonrecycled box
   Station 4 Grocery bags - paper, photo-biodegradable plastic and regular plastic
   Station 5 Razor - disposable, nondisposable, electric
   Station 6 Fruit - prepackaged, bulk (include plastic bag that is often used)
   Station 7 Floor cleaner - brand with cautions about wearing gloves and keeping away from food, brand without these cautions
   Station 8 Carrots - fresh, canned, frozen
   Station 9 Food wrap - aluminum foil, plastic wrap, plastic reusable containers
   Station 10 Toy - metal car, plastic car (See BACKGROUND)

2. Set out the products in stations around the room.

3. Discuss terms; biodegradable, nonrenewable, recycle, reusable.

4. Divide the group into twos or fours. (It is important to have more than one person at each station to stimulate discussion.)

5. Give each group the work sheet "Shopping List". One group recorder will record the appropriate choices based on the group consensus.

6. Explain to the participants they are to make their choices based upon which product will have the least negative impact on the solid waste stream.

7. Encourage participants to discuss their choices in each group.

8. Allow groups to circulate in turn from station to station. It may be necessary to monitor the time at each station and signal when each group should proceed to the next station.

9. When all groups have completed the worksheet, discuss the results in a large group.

MY LITTLE BIT: The learner will strive to purchase the product that has the least negative impact on the solid waste stream.

WE CAN MAKE A DIFFERENCE: Write letters to companies that overpackage their products, hazardous materials, or use materials that cannot be reused or recycled effectively. The letters should ask companies for an explanation of their policies and include reasons or recommendations why they should change such policies perceived as environmentally unsound.

Encourage friends and family to consider the impact on solid waste when purchasing products.

EXTENSION: Get permission from local stores to examine their stock, and produce a list of environmentally friendly products. These items could be shared with other groups, other classes, and the community.

Contact a craft club and encourage them to produce materials made of reused materials.

Shop and Save!

Contact a craft club or home economics department and encourage them to make reusable shopping bags as a money making project. This might be especially appropriate at Christmas time.

Check area stores that sell hazardous household materials to see if they have the legislated hazardous household labels displayed as required by law, and the brochure "Home Sweet Hazards" available. If a store has this all in place, write a letter to thank them. If a store does not have it in place, offer your services, as a small group to help them fulfill this legal obligation. (See BACKGROUND)

Take a field trip to a grocery store and fill out a questionnaire prepared in advance by the teacher. (See BACKGROUND)

EVALUATION:

1. In a brief essay list three things that you or your family have recently purchased that were not wise decisions in terms of solving the waste problem. How could you or your family correct this in the future?

2. (At a later date) How have you changed your buying habits in order to solve the solid waste problem? Give one or more specific examples.

BACKGROUND: This activity may be as simple or as complex as you wish to make it, based on the products that you select for the shopping list. Adjust the difficulty to the level of the students.

The products given in the procedure are just examples. Make your own selections based upon the age group you are dealing with, what you wish to emphasize, and what will result in being least expense. Make use of what is readily available.

Try to limit choices at each station to one or two variables. For examples, if you want the participant to make a decision based on the kind of container, have the amounts in each choice the same.

Some concepts to remember in making your selections are:

Larger packages will use less packaging than smaller ones by the time the consumer is supplied with the same quantity. However, the consumer must consider how fast the product will be used and if it will spoil. Having to throw out spoiled goods only adds to the solid waste problem. Sometimes it is feasible to buy large quantities and share them with others, or to store appropriately to prevent spoilage or deterioration.

Paper packaging is at least readily biodegradable if disposed of properly. Paper is also made from a renewable resource, whereas plastic and aluminum are made from nonrenewable resources. Many types of paper packaging, including cardboard, can be recycled. Paper coated with wax or plastic cannot be recycled.

Many types of plastic containers are not recyclable because of the complexity of their construction. They contain many kinds of plastics that cannot be recycled together. For example, lids are often a different substance than the container.

Some containers, such as glass, are reusable. Glass pop bottles, for example, can simply be sterilized and used for pop again. Glass is recyclable.

Buying recycled products is an important way of keeping the recycling process feasible. If no one buys the recyclable goods, there will not be a market for the items that are being saved to be recycled in the first place.

Consider how long products such as toys, appliances, etc., will last when buying them. For example, in station ten the metal toy car will probably last longer than the plastic one and therefore will not end up in the landfill as quickly. The metal car will perhaps be durable enough to be passed down to brothers or sisters or even grandchildren. Durable items might be sold at garage sales or given to charity so that they will be reused.

A discussion of even better purchases than the ones given at each station will lead to further understanding of what can be done to solve the solid waste problem. For example, instead of any of the bags suggested in station four, participants might suggest bringing their own reusable cloth bag.

It is always important to read labels and buy the least hazardous product. Some hazardous products have safe substitutes.

State legislation on solid waste mandates all stores in Iowa that sell hazardous waste to properly display the hazardous waste tag by each hazardous household product. The pamphlet "Home Sweet Hazards" is also supposed to be accessible to all customer requesting a copy.

A field trip to a grocery store can be a very valuable experience if well planned. The teacher should visit the store and gather the information that will be included on a questionnaire for students. In order to use the limited time efficiently, it is best to arrange the questions about the various products according to aisle numbers. If hazardous materials are sold, a copy of "Home Sweet Hazards" should be requested.

Sample questions for such a field trip might be:

General

- List three over-packaged products and explain how the packaging of each could be improved to benefit the environment.
- Which aisle number contains products that appear to be in packaging that is best for the environment? Describe these.
- Name three hazardous products and their signal words.

Meat

- What are two advantages of not prepackaging fresh meat?

Dairy Case

- Some cheese is sold in chunk or brick form. What are the other forms in which cheese is sold? Which form is the best environmental buy? Is there a cost difference?

By various aisles

- Name the fresh fruit or vegetable that has the most environmentally safe bag. Describe the bag.
- Which is the better buy cost wise, a bag of small size candy bars or an individual regular size candy bar? Figure the price per ounce. Which is the better buy environmentally speaking?
- Dry pet foods are mostly in paper or cardboard. What might be some reasons for such packaging?
- List two products that come in both

aerosol and pump spray containers. Name a product that comes only in aerosol. Which type is best for your health and the environment?

- Select a brand of detergent that comes in boxes of different sizes. Which size box is the best economic buy? Which is the best buy for the environment? Is there a detergent that contains no phosphates? If so, name it. Why are phosphates harmful to the environment?

- Which plates are cheaper, plastic or paper? Which is the best buy for the environment?

- Which cereal for sale here is your favorite? Which cereal is probably the best for your health? Where are the most healthful cereals located on the shelf? Select a cereal that comes in different sizes of boxes. Which is the best economic buy? Do any of the cereals say that the boxes are recycled? If so name one or two.

- Name a brand of cookies that contains no preservatives.

- In what kinds of wrappers does bread come? Does any kind of bread come in a biodegradable wrapper? What kind of a wrapper is this? What is the name of the bread?

Make sure that you ask the manager of the grocery store for permission to bring your group to the store. Explain what your objectives are for this field trip. Give the manager a copy of the participant questionnaire. Ask the manager what day would be best for your group visit. Send a thank you letter to the store soon after your field trip there.

Shop and Save!

Handout: Shopping list (one per group)
Handout:

Names_____
_____
_____

SHOPPING LIST

STATION	PRODUCT	CHOICE	RATIONALE
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
•Repaint • Rebuild • Reinvent • Recast • Return • Redefine
•Rejuvenate • Refashion • Remarkable • Recycle • Reuse •

Appendix

Reinvent • Recast •Return • Redefine • Rejuvenate • Return
Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
• Repaint • Rebuild • Reinvent • Recast • Return • Redefine •
Rejuvenate • Refashion • Remarkable • Recycle • Reuse •
Reinvent • Recast •Return • Redefine • Rejuvenate • Return
• Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
Repaint • Rebuild • Reinvent • Recast • Return • Redefine •
Rejuvenate • Refashion • Remarkable • Recycle • Reuse •
Reinvent • Recast •Return • Redefine • Rejuvenate • Return
Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
•Repaint • Rebuild • Reinvent • Recast • Return • Redefine •
Rejuvenate • Refashion • Remarkable • Recycle • Reuse •
Reinvent • Recast •Return • Redefine • Rejuvenate • Return
Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
Repaint • Rebuild • Reinvent • Recast • Return • Redefine •
• Rejuvenate • Refashion • Remarkable • Recycle • Reuse •
Reinvent • Recast •Return • Redefine • Rejuvenate • Return
Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
Repaint • Rebuild • Reinvent • Recast • Return • Redefine •
• Rejuvenate • Refashion • Remarkable • Recycle • Reuse •
Reinvent • Recast •Return • Redefine • Rejuvenate • Return
Recycle • Reuse • Reduce • Rethink • Refurbish • Reform •
• Repaint • Rebuild • Reinvent • Recast • Return • Redefine •

Appendix

Appendix includes the following sections:

- Conceptual Framework - Iowa Clean SWEEP
- Ideas That Make A Difference
- Background
- Waste Products From Your Car
- General Information on Landfills
- Recycling Resources
- Sarah Cynthia Sylvia Stout poem

Glossary

Field Testers

Conceptual Framework - Iowa Clean SWEEP

I. An overview and finiteness of natural resources and waste generation.
   A. Everyone produces wastes.
      1. Some renewable resources are "rendered unusable."
      2. Some nonrenewable resources are "rendered unusable."
      3. Some wastes are hazardous
         a. hazardous in our home
         b. hazardous to the environment
   B. There is too much waste
      1. Not all waste readily degrades and therefore takes up space.
      2. Degradation is not always desirable (the best use of the resource).
      3. The waste stream is made up of many kinds of wastes.
   C. There is no "AWAY" to throw things.
      1. Appropriate land for landfilling, incineration, or dumping is limited.
      2. Existing landfills are reaching capacity.
      3. No one wants landfills, incinerators, hazardous disposal sites, etc., in his/her back yard (NIMBY).
   D. There are no "EASY" solutions.
      1. Waste disposal has been and still is an ever increasing timeless dilemma.
         a. The amount of waste generated per person is increasing.
         b. The population is increasing.
      2. The renewable vs. nonrenewable issue has validity on both sides.
      3. Solutions have various limiting factors (costs, feasibility, technology, transportation, practicality).
      4. Technology is constantly changing and technology may not provide the solution.
      5. Solutions may require lifestyle changes.

II. Current waste disposal practices and volume reductions.
   A. Waste volume reduction can be accomplished by each person.
      1. People can choose to purchase goods which reduce waste.
         a. People should choose to purchase goods which last the longest to reduce waste.
         b. People should avoid buying disposable products.
         c. People should purchase only the quantity needed.
         d. People should buy products which are not overpackaged.
         e. People should buy in bulk to reduce packaging.
      2. Changes in lifestyle can accomplish waste volume reduction. (and will be essential for Iowa cities and counties to reach their 25% and 50% reduction goals by 1994 and 2000.)
         a. People sometimes generate waste because of fashion, taste, or convenience.
         b. People can learn to purchase products to avoid waste.

c. Buying recycled goods saves resources and diverts waste.
d. There are alternative products which do not produce waste, or hazardous waste.

B. Waste volume reduction is important for business and industry.
1. Business and industry can realize economic benefits.
a. disposal cost savings.
b. better utilization of raw materials
2. Business and industry may realize public relations benefits.
3. Business and industry, through waste reduction practices, may enhance their stewardship of the earth.
4. Business and industry may benefit from increased community service opportunities from waste reduction practices.

C. Waste volume reduction is important for schools and community.
1. Schools and communities may experience an improved public image.
2. Schools and communities may choose waste reduction practices to help meet community service obligations.
3. Schools and communities can be important for role modeling waste volume reduction.
4. Schools and communities can realize economic benefits through waste volume reduction.
a. disposal cost savings
b. better utilization of goods

III. Landfill problems and recycling.
A. Markets and transportation are major limiting factors to recycling.
B. Recycling may require a change in lifestyle.
1. Some people have many objections to adopting recycling.
2. Recycling acceptance may be tied to whomever in the household is ultimately responsible for getting it done.
3. Recycling done in business and industry may require workers to change habits in the workplace.
4. Recycling in schools requires students and school personnel to change habits in the school.

C. Most materials can be recycled and some can be collected and processed in ways which reduce their volume or divert them from the waste stream in other ways.
1. Glass, aluminum and other metals, motor oil, and some paper can be remade into the same products.
2. Plastic must be made into products other than containers which come in direct contact with food.
3. Tires and appliances are disassembled or shredded and have few other uses.
4. Food waste without meat or fats can be composted.
5. Yard waste can be composted.

D. Iowa laws affect the content of the waste stream.
1. Iowa's Bottle Bill enhances aluminum recycling, but other types of beverage

containers are not necessarily recycled.

2. Iowa law prohibits landfilling many materials.
3. Iowa laws require local governments to be responsible for reducing waste volumes going into landfills.

E. There many ways to collect materials.
1. Source separation, done at the household level, puts the responsibility for recycling with the individual and produces a high quality recyclable product.
2. Household recyclables can be picked up at the curb or taken to a voluntary drop-off center.
3. Unsorted garbage may be picked up and mechanically sorted, which produces a low quality recyclable product.

F. The economics for recycling are not always what the public expects.
1. Recycling is not free.
2. The sale of collected materials usually does not pay for the cost of recycling.
3. Recycling creates jobs.
4. Recycling markets dictate which materials can be collected economically.

IV. Methods of reusing, reducing and recycling for waste management.

A. Landfills are the most common method of disposing of wastes.
1. There are many myths concerning landfills.
a. Materials quickly and safely biodegrade in landfills.
b. Material are no longer a problem when in a landfill (out of sight, out of mind).
c. Landfills are without potential hazards to the environment.
d. There is always space for additional landfills.
2. Landfilling will always be a component of solid waste management.

B. Incineration is a method of disposal.
1. There are pros and cons concerning incineration as a method of disposing of wastes.
a. There are advantages to incineration.
1) Incineration does reduce volume of wastes.
2) Incineration may be a cost effective way of handling waste for some communities.
b. There are disadvantages to incineration.
1) Incineration does not recover natural resources.
2) Current state and federal regulations may not be adequate to ensure completely safe emissions.
3) Every burner must be monitored to meet EPA regulations; more burners mean more regulators.
4) Burners are expensive and difficult to regulate for emission controls.
5) Resulting ash may be hazardous in disposal.

6) Incinerators are difficult to site (NIMBY).
7) Cost efficient operation of incinerators depends on consistent volumes of waste which is incompatible with other volume reduction practices.

2. Combustion for energy recovery is often confused with incineration.
   a. Combustion for energy recovery requires specialized burners, specialized fuel handling systems, and specially prepared fuel from the garbage.
   b. Combustion for energy recovery requires a large investment in the specialized equipment which is often dependent on a consistent amount of waste to burn which is incompatible with volume reduction practices.
   c. Only one system exists in Iowa which is designed to recover energy from burning a high percentage of the municipal waste stream (City of Ames).
   d. All of the disadvantages of incineration apply to combustion for energy recovery.

C. Citizens as well as municipalities have responsibilities for waste management.
   1. In Iowa, municipalities, or groups of municipalities, are responsible for planning for waste management.
   2. Businesses and Industries may have their own waste management plans.
   3. Rural citizens are generally responsible for their own waste.

D. Hazardous wastes require special processing for safe disposal.
   1. Iowa law prohibits landfilling or incineration of hazardous materials.
   2. Iowa law provides for a limited number of Toxic Cleanup Days to be held each year to provide households a method for safe disposal of household hazardous materials.

E. Each citizen can reduce the volume of waste she or he produces.
   1. Each person can precycle before an item enters the waste stream.
      a. A product may be rejected before purchase.
      b. Products may be reused, sold, or given away.
      c. Items may be purchased in bulk.
   2. Each person should recycle materials which are collected in his/her area.

V. Waste Costs and Personal Commitments.

A. Disposal costs are increasing.
   1. Actual landfilling costs are often higher than the user fees, including costs for closure and post-closure.
   2. Incineration costs include more than the actual cost of burning waste, such as special handling of ash.
   3. Costs to site, permit, and build new waste handling facilities are increasing.

B. There are tangible costs to disposal of waste that are not included in the user fees.
   1. Filled landfills still need to be monitored.

2. Property values may be negatively affected near disposal sites, whether landfills or incinerators.

C. There are intangible costs to disposal of waste.
   1. Wastes may be generated in extracting the raw materials from the earth.
   2. Wastes are produced in manufacturing products.
   3. Costs to dispose of the products are not reflected in the cost of the product to the consumer.

D. There are intangible benefits to responsible waste management.
   1. Psychological benefits may include reduced anxiety over the solid waste crisis (including NIMBY).
   2. Responsible waste management promotes values consistent with respect for the earth.

Ideas That Make A Difference

Many presentation methods can be used for the following activities. The methods used should be adapted to the specific activity and the creative talents and interests of the participating members. Some suggested methods are:

Essay	Drawing	Research
Story	Poster	Collection
Play	Photo display	Teach a lesson
Poem	Slides	Book reports
Editorial	Video	Bumper sticker
Diary	Audio	Cartoon
Pamphlet	Commercial	Comic strip
Advertisement	Survey	Guest speaker
Model	Graph	Field trip
Debate	Role playing	

1. Make a list of environmentally friendly school supplies and get permission to post this in local stores, including the school store.

2. Make posters, write editorials, do radio and TV service commercials, give presentations to community organizations and businesses about reducing, reusing, and recycling paper.

3. Create, produce, and present a play about paper recycling and conservation for youth groups and elementary students.

4. Develop a presentation for area businesses about the value and procedure of a paper recycling program. This might include a student made video, pictures, overheads, graphs of generic, as well as local school and community data.

5. Help train employees of area businesses to implement and carry out a paper recycling program.

6. Create and present an award to the classroom or youth group that uses the best conservation practices.

7. Research areas of waste in the school and community (food, plastic, paper) and prepare a presentation of findings and recommendations to appropriate personnel. Suggestions might include:

- Have recycling bins for aluminum and uneaten fruit.
- Use a milk dispenser and washable glasses.
- Don't use straws.
- Use washable, reusable service items.
- Recycle cans and bottles used in the kitchen.
- Separate compostable material.
- Reuse bulk containers (Also share these with teachers).

- Allow students to take only what they will eat.
- Encourage people to take only one napkin.
- Use ketchup, mustard bottles, etc., and not individual disposable containers.

8. Hold a reuse day at the school. Wear hand me downs, use materials that have been reclaimed from various sources.

9. Adopt a highway.

10. Hold litter pick up activities within school day or as an after school project.

11. Hold a repair workshop day. Have participants bring a usable item that needs simple repairs. Invite volunteers from the community to come and help students with the repairs.

12. Have a recycling and reuse invention fair. Participants can display either the designs or actual product that they have invented from recycled or discarded materials.

13. Collect and distribute unused magazines to senior citizens or others who express an interest.

14. Keep swap boxes for materials that might be needed for classrooms. This might be especially helpful in shop and home economics classes.

15. Have student committees contact local industries about donating to schools or organizations materials that they normally throw away. It will be important to match the materials to the needs of the school or organization.

16. Invite foreign exchange students or others from foreign countries to talk about the solid waste problem in their land.

17. Invite senior citizens to talk about the differences in solid waste when they were children. (Video or audio tape an interview if the person is not able to visit class).

18. Create a poem, essay, drawing, model, etc. about this historical perspective of solid waste.

19. Have a tree planting project.

20. Organize a paper recycling project in your school or community.

21. Develop a student generated list of ideas that can be used in the school to conserve paper. The list might include:
    - Use both sides of the paper.
    - Make note pads from used paper.
    - Use white or unbleached paper when possible.
    - Use looseleaf notebooks instead of spirals.

- Use paper towels conservatively (or replace with hand dryers).
- Reuse bulletin board paper.
- Maximize the use of the overhead and blackboard.
- Use cooperative learning.
- Use answer sheets for tests so that the test can be reused for other classes and/or next year.
- Use computers for drill and practice.
- Do work on computer and store on disk so revisions will not waste paper.
- Have a box for scratch paper that can be used for notes, drills, etc..
- Organize handouts into two categories (those that will be written on by students and cannot be reused and those that are only used as reference and can be used as a classroom set. If each student needs a copy, these at least can be collected and used again next year.

22. Develop a student generated list of other materials that can be conserved in the classroom. This list might include:
    - Do not vandalize.
    - Use school equipment and supplies properly.
    - Use tape and staples sparingly.
    - Cover books with paper sacks.
    - Have a box for unwanted pencils, erasers, etc..
    - Make projects from normally thrown away items.
    - Use calendar pictures for room posters, bulletin boards etc.
    - Keep a swap box for such pictures.
    - Read the labels and use hazardous materials as directed by label and/or teacher.

23. Develop a student generated list of ways of conserving materials by office and administrative personnel.

24. Select a committee to prepare and present their ideas to the principal and other concerned employees. Such suggestions might include:
    - Buy recycled paper.
    - Make note pads from scrap paper.
    - Make passes from used paper.
    - Use both sides of the paper.
    - Write messages and memos on small pieces of paper.
    - Have a central bulletin board to post announcements.
    - Use the PA for announcements.
    - Order supplies in bulk.
    - Ask to be removed from the junk mailing list.

25. Develop a campaign to encourage people to buy recycled products. Research stores to determine what recycled products are available. This might include recycled paper towels, recycled paper (determine percentage recycled and if from con-

sumer generated waste), and recycled boxes (80% of all recycled paper is used for containers such as cereal boxes). Information given to the public should include not only types of recycled materials available, but rationale for purchasing such items, and ways to identify recycled items (look for recycling symbol or gray cardboard).

26. Arrange for field trips to the landfill and/or the local recycling drop-off center.

27. Develop a campaign to encourage community recycling. Write article for school or community newspaper.

28. Attend community meetings such as city council, landfill commission, recycling task force, etc., to learn about current policies and trends in solid waste problems. If appropriate, express your opinions about an issue.

29. Write a letter to the editor taking a stand on a controversial solid waste issue that is being debated in your community. Use information gained at meetings to help support your stand.

30. Visit stores in the community to locate the types of hazardous waste that they sell. Check to see if hazardous waste stickers are in place and "Home Sweet Hazard" pamphlets are available as required by law. If not, volunteer to help put these in place.

31. Develop a letter writing campaign to companies who manufacture over packaged products. The letter should inquire about the reasons for the packaging, state your reasons for objecting to the packaging, and perhaps offer a better alternative.

32. Initiate an organized effort to request less packaging and paper instead of plastic containers in fast food restaurants. Be sure that all participants are respectful, polite, and create a positive image of someone who is sincerely concerned about the quality of our environment.

33. Organize a letter writing campaign thanking all those businesses and industries who are making definite progress in reducing both the amount and the hazards in our solid waste stream. Be specific about what action you like and state the reasons for this.

34. Create uses for the classroom of items that would ordinarily be discarded. Once uses have been created, decide which uses are needed in the school. Develop a check list of the items with their uses and distribute to the teachers. Teachers should indicate on the check list what materials they might use, and based on this information have students bring the items to a centralized collection center or to the rooms involved. Groups might take a teacher list and be responsible for acquiring the desired materials. Such materials and possible uses might include:

Ideas That Make A Difference

Material	Use
- baby food jars	beakers
- carpenter shavings	animal bedding
- cereal boxes	poster backing
- checkbook box	crayon or pencil box
- coat hangers	mobiles
- egg carton	seed or rock collections
- film containers	soil samples
- magazine pictures	creative writing, collages, posters
- metal can	pencil holders
- plastic milk container	bird feeders, water supply holders
- 2 liter pop bottles	mini terrariums, funnels, filters, models for soil layers
- grocery bag	book cover
- plastic lids	petri dishes
- polystyrene pkg	projects
- shredded paper	animal bedding, garden mulch

Background

PLASTIC - Plastic recycling is a technology that is changing very quickly, so fast that some of this information is likely to be dated by the time it gets printed and distributed! However, there are a few things about plastic recycling that everyone needs to know.

Plastic is a petroleum product and petroleum is a nonrenewable resource. There are some very important functions which plastic can fulfill and there are also some very wasteful ways we use plastic. Annually, food packaging accounts for 13 billion pounds of plastic packaging out of the 57 billion pounds of plastic produced. Only one percent of the plastic is being recycled as of January 1991.

There are many different combinations of different kinds of plastics which are used in products and packaging. Though each individual kind of plastic may be recyclable, it can be difficult to identify and separate the different kinds and colors of plastic. Unless the final color of the product using recycled plastic is very dark, or if it is not important that all of the product be the same color, colored plastics must be separated from colorless plastics. Some plastic containers may be made of several layers, sometimes of different kinds of plastics. These layered plastics have not been collected by community recycling programs in Iowa as of January 1991.

The properties of plastic which make it useful as a material also make it difficult to collect economically. It is lightweight for the volume it takes up which makes it inefficient to haul unless compacted by baling or by granulating. Manufacturers are most interested in full loads of one kind of plastic and prices are calculated by the ton. For many recycling agencies, it takes a long time to collect a ton of any one kind of plastic and it takes a lot of space to store the baled or granulated plastic. The easiest plastic to collect is HDPE or high density polyethylene which is used for dairy bottles and most laundry product bottles. But, imagine how long it would take to get a ton of plastic bags (often LDPE or low density polyethylene), or how much space you would need for a ton of expanded polystyrene foam. Both of these plastics have been collected by recycling programs in Iowa but unstable markets, low prices, and transportation problems have limited these collections to date.

The most important thing about recycling plastic and about packages touted to be recyclable is to know whether <u>you</u> can recycle it or not. Does a nearby recycling center take the kinds of plastic you use? This is true of all recyclable materials but because the plastics industry has felt targeted by consumers, they have responded with a strong campaign to reassure consumers that plastic containers are recyclable. (The voluntary plastic labeling system was generated by the plastics industry which was concerned that enviromentally-conscious consumers would reject plastic packaging in favor of paper or glass competitors, or the possibility that legislative bans on plastic packaging would be initiated.)

GLASS - Container glass is the only glass collected in quantity by community recycling programs in Iowa. The colors of glass must be separated, brown, green, and clear (or industry terminology is amber, emerald, and flint respectively). The glass must be crushed to be sold and it is generally run through a special glass crusher which produces cullet that is somewhat uniformly-sized and not sharp-edged. The cullet may be stored in large barrels or other types of containers for hauling by trucks or even hauled by rail out of Iowa to the glass manufacturers.

Background

Recycling glass is very energy efficient for the glass industry as the cullet melts at a lower temperature than new materials so it is often mixed up to 25% of every batch of container glass. The used glass may also be recycled into the same kind of container which makes it an ideal recyclable material. There is no chance of contamination because of the high temperatures in glass processing.

Glass should be rinsed free of the original contents, and have any metal or plastic lids or rings removed. Paper labels are usually not a problem for the processors. Accurate color sorting makes the cullet easier to sell as even a few pieces of colored glass in a batch of clear glass can tint the final glass product.

Another advantage of glass containers is that they may be sterilized and refilled and REUSED! Currently only soft drink bottles are refilled in Iowa. A glass beverage bottle may be returned for refilling as many as fifteen times and then it can be recycled back into another beverage bottle. Glass markets are located outside of Iowa, the closest are in Minnesota, Oklahoma and Illinois.

METAL CANS - The familiar soup and vegetable cans we know as tin cans actually have very little tin content but are mostly made of steel. These cans go through a detinning process which separates the metals. Tin and iron ore, from which steel is made, are both nonrenewable resources.

For consumers to prepare their own cans for recycling they need to rinse them clean and remove the paper labels. Some recycling centers require the cans to be flattened and some do not. To save space at home it is efficient to cut both ends out of the cans and flatten the can. Some recycling programs will accept the ends of the cans as long as they are flattened inside the can. Other centers reject the sharp lids entirely.

Some scrap metal dealers will accept cans if a recycling center is not nearby. The metal cans are usually compacted into a cube or bale to be hauled by truck or rail to the markets currently located in Minnesota, Texas and Indiana.

ALUMINUM - Local scrap metal dealers will usually handle large quantities of aluminum such as siding, window frames or other construction waste. Household aluminum waste can be recycled but must be collected in enough quantity to be marketable.

Iowa's Bottle Bill provides a collection mechanism to make it easy for most of the beverage can aluminum to be recycled. Nationwide aluminum recycling of beverage containers reached 50% in 1989, largely due to the few states with Bottle Bills, and of those states Iowa's rate of return was the highest. Recycling centers in states without bottle bills can earn income from selling beverage can aluminum which they can collect at the recycling centers in quantity. In some years, the high dollar-value aluminum has been profitable enough for recycling centers in other states to subsidize the collections of lower dollar-value materials.

Even without the beverage container aluminum, recycling centers in Iowa can successfully collect household scrap aluminum and add to the high rate of aluminum recycling. All aluminum for recycling needs to be clean.

It takes much less energy for manufacturers to recycle aluminum than to process the bauxite ore into new aluminum. Bauxite is a nonrenewable resource mined in Caribbean Nations. Because the energy savings cut production costs, the aluminum industry has done much on its own to promote recycling.

PAPER - The plant fibers which are used to make paper most often come from trees. While trees are a renewable resource, they are also of great benefit to the earth as living plants. It takes a long time to grow trees so it makes sense to use the fibers we get from them as efficiently as possible.

Until very recently, the conscious consumer demand for any recycled paper was very low. In fact, some recycled office grade paper made in the 1970's was of such poor quality that it was never recommended for use. Therefore, few paper mills had the processing equipment in place to accept used paper of any grades unless it had come from within the paper mill (envelope trimmings, ends of large paper rolls, etc.). State-mandated recycling programs created a flood of post-consumer newspaper in the late 1980's, which the paper mills were not prepared to handle.

New developments at paper mills have allowed the processing of additional quantities and grades of post-consumer paper. Even so, all recycled paper does not necessarily contain post-consumer paper. Paper does not have to contain any specific percentage of recycled paper to be labeled "recycled."

Different grades of paper need to be kept separate for highest value in milling. High grade computer print-out, or CPO (green bar usually used by accountants), can be recycled back into computer print-out paper. High grade office paper can also be recycled back into office paper. Newsprint can become newsprint again. Any of these papers mixed together can be used for lower grades of paperboard depending on the requirements of the "recipe" used by the mill.

Other uses for paper, particularly newsprint, have included shreds for use as animal bedding in place of straw, pulverized newsprint for use as blown-in insulation in homes or buildings, and pulp which can be molded into fruit trays and egg cartons. Applications are dependent on local markets.

Paper collections vary widely but generally the more specific the sorting required, the higher the value of the collected paper. Some collections exclude all colored papers and others will accept a small amount of pastel colored paper. Currently there are no large collections of magazines for recycling in Iowa. Metal objects as large as paper clips may be accepted as the recycling process usually can remove them. However, even small staples may be rejected if the paper is to be used for animal bedding as the metal is dangerous to the animals. Laser-printed paper is usually down-graded in price as the laser printing actually burns the print into the fiber and causes flecks in a recycled white paper. Telephone directories and other paperbacked catalogs have the dual problem of mixed papers (heavier cover stock and thinner ground wood pages) and the hot glue used to bind the books together. Glues which are not water-soluble are always a problem for recycling as they may cause a variety of flaws

which the industry colorfully terms "hickies", "stickies", or "slime holes". The key to a successful paper recycling program is to learn the specific requirements of the paper buyers and be careful to sort, sort, sort!

Cardboard collections require large quantities of cardboard which are not contaminated by waxed cardboard, fused plastic liners, or food waste. Cardboard must be baled in very specific sizes to load efficiently in trucks for hauling. As of 1990, there is a fairly well-developed network of cardboard collections throughout the eastern one-third of Iowa extending into the central one-third of Iowa.

As paper fibers are recycled over and over they get broken and frayed which eventually makes them unsuitable for the highest grades of paper. It is possible to use the paper to make various grades of paper-board (different from cardboard) which is used to make boxes or cylinders for food storage like cereal boxes. While solid white grades of recycled paperboard may be milled, most paperboard made of recycled paper is a light gray or light brown and covered with a thin white sheet of paper specially coated to receive printing inks.

Magazines and slick papers are difficult to recycle because of the heavy clay coating used to make the paper perfect for receiving printing inks. Some new techniques suggest that the clay coating helps absorb the toxic inks form the recycling water bath so future recycling collections may someday include magazines and slick papers.

HOUSEHOLD BATTERIES - Rechargeable batteries should be used when possible and specific batteries, such as hearing aid or watch batteries, should be taken back to the store where they were purchased so they can be properly disposed. Car batteries can be recharged, and the retailer of car batteries must take back and properly dispose of unusable car batteries. Invite someone from the Department of Natural Resources (D.N.R.) or the Solid Waste Commission to speak on these specific issues.

Batteries are just one of many potential sources of hazardous materials which may get accidentally put in a landfill. Any hazardous materials in a landfill could get into the groundwater in various ways. All across the United States there are locations where hazardous materials have leaked from landfills and contaminated water supplies.

Batteries are a common product which many people don't realize should not be put in a landfill. Unfortunately, battery recycling is not widely developed, either as a technology nor as part of a recycling collection program. When batteries are recycled, most commonly the metals are what is reclaimed. Different kinds of batteries have different metals in them such as lead, mercury silver, nickel, or cadmium.

In 1990, only one company in the eastern United States recycled the common household "C-" or "C-" cell type of battery. Any collection program receiving batteries and accumulating a large quantity of them would run the risk of becoming a hazardous waste site if batteries were broken and leaked.

Car and truck batteries are heavy to handle and can be messy with leaking acids and corrosion. However, there is a system for getting rid of them through some metal scrap dealers. Any retail outlet

which sells batteries must take back spent batteries. A few recycling collection programs will take batteries, also. Sometimes a small amount of money is paid for the returned batteries.

The easiest batteries to recycle are the small button batteries used in cameras, watches, hearing aids and calculators. Most jewelers in Iowa have access to dealers who will buy the spent batteries from them. Even thought these batteries are very small, they must not be put in the landfill. It would be possible for a battery to be crushed in the collection or compaction process. The mercury in a hearing aid battery could contaminate six tons of refuse.

Reserve Information

Iron Ore
210 min. metric tons

USSR
Brazil
Australia
China

Crude Oil
billions of barrels

Saudi Arabia	255.0
Iraq	100.0
United Arab Emerata	98.1
Kuwait	94.5
Iran	92.9
Venezuela	58.5
Soviet Union	58.4
Mexico	56.4
U.S.A.	25.9

Aluminum - Bauxite
25,000 min. metric tons

Guinea and Australia 46%

Copper
570 min. metric tons

Chile
U.S.A.
(Arizona, New Mexico)
USSR
Canada

Waste Products from Your Car

TIRES - Worn tires are not easy to recycle and the availability of tire recycling in Iowa is not well developed in 1991. One company has the capability of producing rubber chips which can then be used for paving roads (it extends the life of the asphalt by four or five times) or runways or playgrounds. The market for rubber chips in Iowa is not well developed. Only about one fifth of the tires are retreaded in the United States. Only tires in which the casing is in good shape are suitable for retreading and there is still a stigma against buying retreads though the technology for producing good quality retreads exists.

Most companies which sell new tires will take your old tires, sometimes with a charge per tire. Stockpiles of tires are breeding grounds for mosquitos. Burning of tires is not permitted, as it causes air pollution which contributes to acid rain and leaches waste products into the ground.

ANTIFREEZE - There is limited recycling of antifreeze available in Iowa in 1991. There are basically two processes for recycling antifreeze; redistilling or filtering by a machine. If a service station changes your antifreeze, ask what they do with it, and if they would take antifreeze (for a fee) from do-it-yourselfer to be recycled.

Above all else, do not pour antifreeze down storm drains or on the ground. It is especially toxic to pets which are attracted to its sweet taste, they drink it and they die.

WASTE OIL - More oil is spilled into the environment each year by do-it-yourselfer's than all the oil spilled by the Exxon Valdez. They dump used oil on the ground, down sewers, or hide it in the trash where even sealed containers get crushed in the landfilling process.

By Iowa law, every retailer who sells motor oil must take used oil back or post the location of the nearest waste oil collection site. Check with the collection site and ask the hours they are open, and if there is a limit to the quantity of oil they will receive. Be sure to keep all contaminants such as antifreeze, gasoline, water, and solvents out of the oil or they won't accept the contaminated oil.

Waste oil is rerefined and becomes good as new, and can be recycled indefinitely according to oil recyclers. Most waste oil is blended into fuel for industrial furnaces, however, because of limited rerefining capabilities.

BATTERIES - A car battery contains about eighteen pounds of lead and about a gallon of sulfuric acid, definitely not materials to casually toss into the environment. The lead can be melted down by processors and reused in a new car battery. The sulfuric acid may be reprocessed or end up in a hazardous waste facility. The plastic in the casing can also be recycled into new battery cases.

By law, retailers who sell batteries must take an old battery as trade-in, although you may have trouble getting them to take a cracked, leaking battery. Check with a local recycling center, service station, or retailer who sells batteries to find a place to recycle spent batteries from vehicles.

Other commonly discarded items may or may not be recyclable where you live. Many items are difficult to recycle because the technology is not well developed, some are not economical to recycle in small population areas, and some items are so expensive to process compared to working with the raw material that not even large quantities are recycled.

TEXTILES - Used clothing may be resold in thrift stores, cut up and sold as rags, or shipped to third world countries. Donate only good wearable clothing to thrift stores and avoid using them as dumping grounds as it costs them to dispose of garbage just as it does you. Be creative with your unwearable clothing or make rags to used and washed instead of disposable towels in the kitchen or shop.

BOOKS - Both hardbacked and paperbacked books have glues that make them poor candidates for recycling. At best, there may be a work opportunity center which may take a limited quantity of books for their clients to tear apart to salvage the paper, and then only if they have a paper broker who will take the paper for recycling.

APPLIANCES - In solid waste lingo, these are referred to as "white goods" and include stoves, freezers, refrigeraters, washers and dryers, and miscellaneous other appliances. While some scrap metal dealers will take these items, the unrecyclable part of these may be the motors if they were made before 1980. If they are old, they may have a "drive motor capacitor" which may contain PCB's (paradichlorobenzene) though not all old motors did. PCB's are so highly toxic the EPA banned them in 1979.
Air conditioners, freezers, and refrigerators may still contain the CFC (chlorofluorocarbon) coolants which deplete the ozone if not reclaimed. Contact a service station or appliance repair shop to see if they will (for a fee) withdraw the CFC's for recycling. Don't allow anyone to simply vent off the CFC's or let them evaporate.

General Information on Landfills

Estimates on the amount of waste Americans generate varies between 3 and 4 lbs/person/day. The amount appears to be increasing over time. This, coupled with a growing population, makes waste disposal an issue of greater significance than at any previous time in history. How we dispose of this waste has consequences for us as a society. At present there exist two general types of disposal methods, each with perceived advantages and disadvantages: 1) landfills; and 2) combustion facilities.

Landfills are essentially holes dug in the ground for use as receptacles for solid waste or garbage (excluding hazardous waste and other specified materials). The intended consequences of landfilling were to bury waste underground and permit it to decompose through natural degradation.

A. Advantages of landfills is the technology with which we are most familiar and perhaps best understand.

B. Disadvantages of landfills:
   1. potential threat to groundwater through leachate.
   2. reaching capacity and are becoming increasingly costly to open (daily operating costs, closing costs including potential liability). Estimates of direct costs for siting, opening, and closing a landfill in Iowa are well in excess of $1 million.
   3. don't create an environment which permits decomposition.
   4. relatively difficult to site.

Combustion facilities consist of two types: 1) incinerators which are designed to burn garbage as a means for achieving volume reduction; and 2) waste-to-energy facilities which are used to generate various amounts of electricity or other energy forms.

A. Advantages of combustion facilities:
   1. reduce significantly the volume of waste which must be landfilled.
   2. waste-to-energy facilities recapturing as energy some of the material in the solid waste stream.

B. Disadvantages of combustion facilities:
   1. dioxins and other potential carcinogenic materials emissions without appropriate management.
   2. heat, carbon dioxide and other seemingly benign gases contribution to the greenhouse effect.
   3. the residue ash landfilled and it may contain significantly higher concentrations of heavy metals and other materials that are potentially hazardous.
   4. combustion facilities traditionally very difficult to site due to NIMBY factors.
   5. combustion facilities very capital-intensive, especially waste-to-energy facilities. In addition, the quality and quantity of waste used to generate energy may need to be kept at a more constant level.

Another "option" is to build a transfer station. These are sites where wastes are temporarily stored until they can be removed to a waste disposal facility at another location.

A. Advantages:
   1. politically expedient (less controversial than other two options).
   2. relatively low capital costs.
   3. present minimal environmental threat to immediate area.

B. Disadvantages:
   1. not taking responsibility for the solid waste problem.
   2. costs of waste disposal generally forfeited to those who control the ultimate disposal

site (at the mercy of those entities).

Two alternative means for addressing the solid waste disposal dilemma are: 1) recycling (reprocessing "waste" materials and creating new goods); and 2) waste reduction (finding alternative uses for materials or simply doing with less material which may require disposal). Again, each has its advantages and disadvantages.

A. Recycling Advantages:
   1. reduce volume of materials requiring disposal of waste as a means for saving capacity.
   2. save cost of landfilling what would otherwise be waste.
   3. possibly incur some saving through sale of materials.
   4. potential energy savings in creating new products not made from virgin materials.

B. Recycling Disadvantages:
   1. development of separate collection process for recyclable materials.
   2. scarcity and uncertainty of markets.
   3. educate people to change waste disposal habits.

C. Reduction advantages:
   1. reduce volume of materials requiring disposal of waste as a means for saving capacity.
   2. save cost of landfilling what would otherwise be waste.
   3. minimal cost and logistical considerations.
   4. create a less wasteful "mindset"

D. Reduction disadvantages: requires substantial educational efforts to change traditional patterns of behavior.

One last factor for consideration. Recycling programs can follow different models that are identified by various combinations of four characteristics:

A. Curbside pickup
   1. advantages: reduced labor costs for recycling authorities; convenience to household.
   2. disadvantages: more complicated to implement; requires specialized equipment (increased capital costs) for both household and recycling authority; may present space problems especially for apartment dwellers.

B. Drop-off center
   1. advantages: less capital intensive to implement; less complicated to implement.
   2. disadvantages: less convenient for households; more difficult to monitor participation.

C. Mandatory participation collected.
   1. advantage: more participation to maximize volume of recyclables.
   2. disadvantages: more difficult to gain public approval; public more resistant to being told what to do; politically more difficult to advocate.

D. Voluntary participation
   1. advantage: participants are likely to be dedicated recyclers who do it correctly.
   2. disadvantage: rate of participation is likely to be lower which means fewer recyclables are being removed from the waste stream.

Recycling Resources

For more information about recycling, of specific products or just in general, there are a number of places that you can contact for help.

Aluminum Association, 900 19th St. N.W., Washington, D.C. 20006. (202) 862-5100

Aluminum Recycling Association, 1000 16th St. N.W., Suite 603, Washington, D.C. 20036. (202) 785-0951

American Paper Institute, 260 Madison Ave., New York, NY 10016. (212) 340-0654.

Council for Solid Waste Solutions, 1275 K St. N.W., Suite 900, Washington, DC 20005. (202) 371-5319. Affiliate of Society of the Plastics Industry, same address (202) 371-5200

Council on Plastic and Packaging in the Environment, 1275 K St. N.W., Suite 900, Washington DC 20005. (202) 789-1310

Environmental Defense Fund, 257 Park Ave. South, New York, NY 10010. (212) 505-2100.

Foodservice and Packaging Institute, 1025 Connecticut Ave. N.W., Suite 513, Washington DC 20036. (202) 822-6420.

__Garbage Magazine__, published bi-monthly for $21/year (1991 subscription price) write to: GARBAGE, P.O. Box 51647, Boulder, CO 80321-1647.

Glass Packaging Institute, 1801 K St. N.W., Suite 1005-L, Washington, DC 20006. (202) 887-4850.

Governmental Refuse Collection and Disposal Association, 8750 Georgia Ave. Suite 123, P.O. Box 7219, Silver Spring, MD 20910 (301) 585-2898.

Institute for Local Self-Reliance, 2425 18th St., N.W., Washington, DC 20009. (202) 232-4108.

Institute of Scrap Recycling Industries, 1627 K St. N.W., Washington, DC 20006. (202) 466-4050.

Recycling Handbook, J & M Recycling, P.O. Box 504, Washington, IA 52353. (319) 653-2463.

Iowa Department of Natural Resources, Wallace State Office Building, Des Moines, Iowa 50319. Contact Bob Meddaugh, (515) 281-8176 for specific brochures and information.

Keep America Beautiful, Mill River Plaza, 9 West Broad St., Stanford, CT 06902. (203) 323-8987.

National Association for Plastic Container Recovery, 4828 Parkway Plaza Blvd., Suite 260, Charlotte, NC 28217. (704) 357-3250.

National Oil Recyclers Association, c/o Thelen, Marrin, Johnson & Bridges, 805 15th St., N.W., Suite 900, Washington, DC 20005. (202) 962-3000.

National Polystrene Recycling Company, P.O. Box 66495, Washington, DC 20035. (202) 296-1954.

National Recycling Coalition, 1101 30th St. N.W., Suite 305, Washington, DC 20007. (202) 625-6406.

National Soft Drink Association, Solid Waste Management Dept., 1101 16th St. N.W., Washington, D.C. 20036. (202) 463-6700.

National Solid Waste Institute, 10928 North 56th St., Tampa, FL 33617. (813) 985-3208.

National Tire Dealers and Retreaders Association, 1250 I St. N.W., Suite 400, Washington, DC 20005. (202) 789-2300.

Polystyrene Packaging Council, Inc., 1025 Connecticut Ave. N.W., Washington, DC, 20036. (202) 822-6424.

Steel Can Recycling Institute, Foster Plaza 10, 680 Andersen Drive, Pittsburgh PA 15220. (800) 876-SCRI.

Video Tape - The Resource Revolution, Society of the Plastics Industry, Inc., 1275 K Street NW, Suite 400, Washington, DC 20005. 1-800-2 HELP - 90

__The Recycler's Handbook__, paperback book by the The Earths Works Group, (authors of 50

Recycling Resources

Simple Things You Can Do to Save the Earth). Write to: Earth Works Press, 1400 Shattuck Ave., #25, Berkeley, CA 94709. For school or library discounts write or call (415) 841-5866.
**NOTE: Very Useful Items

Iowa Recycling Directory, Waste Management Authority Division, Iowa Department of Natural Resources, Wallace State Office Building, Des Moines, Iowa 50319.

* There are five different meanings for the word **recycling!** Be clear about what you mean and what your audience understands when you use the word!

DEFINITIONS OF RECYCLING

Official EPA - collection, reprocessing, marketing, and using materials once considered trash.

Dictionary definition - the same material is used over and over to make the same - or an equivalent product. This cuts the amount of virgin materials required for manufacturing.

One way - like for plastics - a plastic container is used once, then the material is used in a new and different item. This keeps the material out of landfills temporarily, but doesn't cut down on resources used to keep making the original product.

Manufacturer's definition - If a factory uses the same material twice, they feel they've recycled. The same goes if they use scraps (i.e., paper clippings left over after envelopes are cut)

Thrifty definition - reusing something

SARAH CYNTHIA SYLVIA STOUT WOULD NOT TAKE THE GARBAGE OUT

Sarah Cynthia Sylvia Stout
Would not take the garbage out!
She'd scour the pots and scrape the pans,
Candy the yams and spice the hams,
And though her daddy would scream and shout,
She simply would not take the garbage out.
And so it piled up to the ceilings:
Coffee grounds, potato peelings,
Brown bananas, rotten peas,
Chunks of sour cottage cheese.
It filled the can, it covered the floor,
It cracked the window and blocked the door
With bacon rinds and chicken bones,
Drippy ends of ice cream cones,
Prune pits, peach pits, orange peel,
Gloppy glumps of cold oatmeal,
Pizza crusts and withered greens,
Soggy beans and tangerines,
Crusts of black burned buttered toast,
Gristly bits of beefy roasts...
The garbage rolled on down the hall,
It raised the roof, it broke the wall...

Sarah Cynthia Sylvia Stout

Greasy napkins, cookie crumbs,
Globs of gooey bubble gum,
Cellophane from green baloney,
Rubbery blubbery macaroni,
Peanut butter, caked and dry,
Curdled milk and crusts of pie,
Moldy melons, dried-up mustard,
Eggshells mixed with lemon custard,
Cold french fries and rancid meat,
Yellow lumps of Cream of Wheat.
At last the garbage reached so high
That finally it touched the sky.
And all the neighbors moved away,
And none of her friends would come to play.
And finally Sarah Cynthia Stout said,
"OK, I'll take the garbage out!"
But then, of course, it was too late...
The garbage reached across the state,
From New York to the Golden Gate.
And there, in the garbage she did hate,
Poor Sarah met an awful fate,
That I cannot right now relate
Because the hour is much too late.
But children, remember Sarah Stout
And always take the garbage out!

Shel Silverstein - *Where The Sidewalk Ends*
Copied by permission
Harper Collins Publishers
10 East 53rd Street
New York, New York 10022

Glossary

advertising any method of encouraging people to buy products, such as tv commercials, magazine ads, product packages

aerobic with oxygen, usually in reference to bacteria which thrive in the presence of oxygen

alkaline in terms of batteries, a type of battery

alloy a blend of two or more metals

alternatives other choices

aluminum can a can made of aluminum, most soda cans in Iowa are aluminum

anaerobic without oxygen, usually in reference to bacteria which thrive in the absence of oxygen

atmospheric emissions substances emitted into the air

battery chemicals metals and acids which are used to make batteries useful

bauxite aluminum ore

bimetal can a can made from two or more metals, usually, steel, tin, or aluminum

biodegradable readily decomposed by bacterial action, breaks into elements which are reusable

BTU British Thermal Unit, a way of expressing a unit of heat

compost as a verb, a method of hastening the natural decomposition process for waste products which were originally plant materials

compost as a noun, the end product of the composting process which looks like soil

consumer a person who buys a product

consumption processing, buying, or using a product

conserve to keep in a safe or sound state

contaminant any substance added to a material which makes the material unusable

couch in making paper, expressing water from the paper pulp

cullet scrap glass, usually broken up into small, uniform peices

curbside recycling a method of collecting separated recyclables at the curb, in the same way garbage is collected

disposal discarding

dropoff recycling a method of collecting separated recycleables where an outside bin is provided at a specific location and people are responsible for taking their recyclables to the bin.

existence life, living

finite a limited amount

floating a method of separating materials using water to sort out contaminants which float (see sinking)

groundwater water which is found underground as opposed to rivers or surface water

high density polyethylene (HDPE) a plastic resin most familiar as milk jugs or laundry bottles

hazardous something which is potentially harmful

hazardous waste any waste material which can be harmful

impermeable cannot by penetrated by liquids

incinerate to burn to ashes

inorganic composed of matter other than plant or animal

kiln an oven which can be heated to extremely high temperatures

landfill as a verb, a method of processing garbage by creating a hole in the ground with a bottom which should not allow liquids out, and adding garbage which is covered by 6 inches of dirt every day

landfill as a noun, the place where garbage is buried; in Iowa only sanitary landfills are allowed (see sanitary landfill)

leachate from a landfill, any liquid which had passed through garbage, dissolving or rinsing part of it so that the resulting solution was any combination of liquid garbage.

life cycle cost in simple terms, the cost of any item compared to how long it lasts

litter any materials which are thrown about outdoors or in a public place

magnetism the property of being magnetic (able to attract iron or steel)

manufacturer one who manufactures something

metal a chemical element which has luster, can conduct electricity or heat, a durable material used for many products

NIMBY an acronym which stands for the attitude expressed by people who say "...not in my back yard!"

non-biodegradable cannot be broken down by bacterial action

nonrenewable in terms of resources, a resource which is limited in amount and more can't be created

open dump an illegal method of garbage handling where garbage is dumped in one place and not covered or kept from wildlife or kept out of the water supply

petroleum a natural resource extracted from deep underground and then processed into products such as fuels and oils, or plastics and asphalt.

permeable can be penetrated by liquids

pesticides humanmade chemicals used to kill a variety of organisms, includes herbicides or insecticides.

photodegradable can be broken down by light

plastic humanmade materials consisting of large molecules called polymers, usually made from petroleum

polyethylene-terephthalate (PET) a plastic resin most familiar as the main chamber of soda bottles

polystyrene a plastic resin most familiar in the expanded foam form (foam cups, peanut shaped packing beads, insulation)

polyvinyl chloride (PVC) a plastic resin most familiar as pipes or cooking oil bottles

post-consumer solid waste waste materials produced by consumers

porous full of pores, permeable to liquids

precycling choosing not to purchase a product which cannot be recycled

raw materials the original substance used to make a product

recharge for batteries, a method of replacing the stored electrical energy which has been used

recyclable something which can be successfully collected and reprocessed into the same product or changed into another product for sale

recycle the process of sorting and collecting waste materials which are then re processed, resold, and reused

recycler often used to describe anyone who handles materials along the process of being reprocessed and sold for reuse

refuse as a verb, to not accept

refuse as a noun, another term for garbage

renewable in terms of resources, a resource which either can't be used up or more of the resource can be created

resources anything which is ready for use

reusable any product which can be either reused in it's present form or used for a different purpose

reuse use an item over for the same purpose or use the item over for a different purpose

sand tiny grains of rocks

sanitary landfill a method of putting garbage in a hole which limits the chance that garbage will cause health problems for either humans or wildlife (see landfill, verb)

Glossary

screening material separated by either passing through a screen or being caught on a screen

separation at the source separation of garbage into different materials at the place where the garbage originates

silica one of the ingredients in glass

sinking a method of separating material using water to sort out contaminants which sink

slurry in paper making, a watery mixture of paper fibers or pulp

soda lime one of the ingredients for making glass

solid waste any nonliquid, nongaseous waste material (industrial solid waste is that produced by industry, post-consumer solid waste is that produced by consumers)

sorting separating an unsorted mixture into groups of similar parts

stratigraphy layers of rocks and soils

survival to remain alive

surficial aquifer an aquifer (water bearing rock, sand or gravel)formed in sand or gravel that was deposited by glaciers or rivers

tin can essentially a steel can with a tin coating, the tin is a very small part of the weight of the whole can

toxic (toxins) poisonous

trash as a noun, synonym for garbage, waste

waste stream usually used as a noun to describe all of the garbage people generate and discard (includes household and industrial waste unless so indicated)

winnowing to remove by a current of air

zinc a metal

Field Testers

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